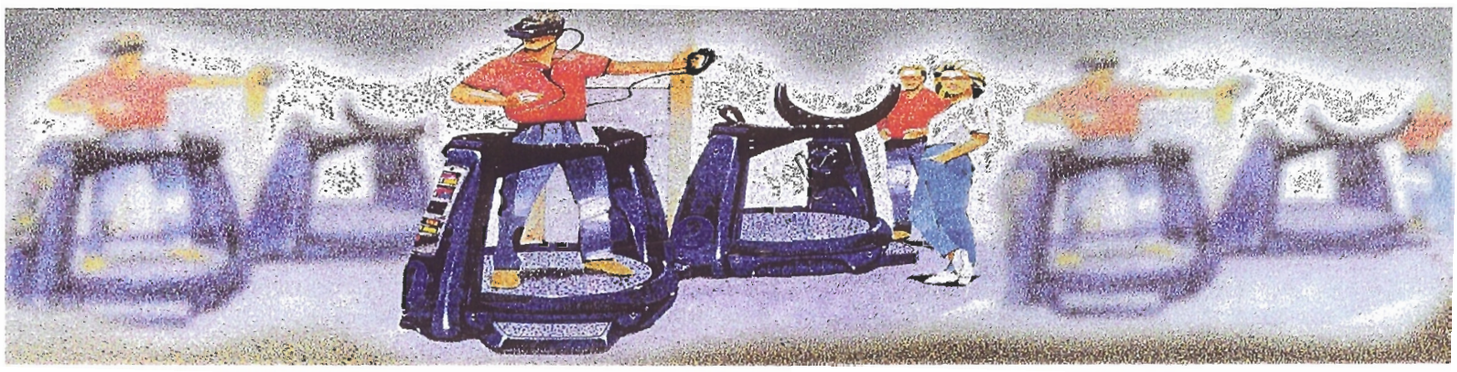
VIRTUALITY HARDWARE



CYBERBASE SU2000

VR CONSOLE FOR USE IN A STANDING POSITION

TECHNICAL MANUAL

VIRTUALITY®

ERA
TECHNOLOGY

Certificate of Compliance

Issued to: Virtuality Group

Item: Cyberbase

Type Reference: SU2000 and SD2000

This is to certify that the equipment defined above has been tested by ERA Technology Limited as follows:

Electromagnetic Compatibility Tests on the Cyberbase SU2000 and SD2000:

EN55022 : 1987 Class B
EN60555 : 1987 Part 2
EN50082-1 : 1992
FCC Part 15 Subpart B Class A : 1992

Full details are given in ERA Report No. 5044/7R6/1

Certificate prepared by: .....R. Orchard.....
R Orchard

Certificate approved by: .....G P Hicks.....
G P Hicks
Manager
EMC Commercial & Industrial Department

Certificate No. 5044-94-110
This certificate is dated 23 February 1994

Established in 1920, ERA Technology Limited operates as a private independent contract research, engineering and testing organisation providing confidential services across a large part of the electromagnetic spectrum.
ERA is approved to BS 5750: Part 1; 1987/ISO 9001, AQAP 1 and AQAP 13.
ERA Technology Limited, Cleeve Road, Leatherhead, Surrey KT22 7SA. Tel: Leatherhead (0372) 374151 Telex 264045.

SU2000 CyberBase

SU 2000

TECHNICAL MANUAL

© Virtuality March 1994

Written and compiled by Mark Giles
Senior Service Engineer
Illustrations and typesetting by B. Kerry

VIRTUALITY®

Virtuality Entertainment Ltd.
Virtuality House
3 Oswin Road
Brailsford Industrial Park
Leicester LE3 1HR
Tel : 44 (0)116 2337000 Fax: 44 (0)116 2471855
Customer Service Dept.
Tel: 44 (0)116 2548571
Fax: 44 (0)116 2548573

SU 2000 TECHNICAL MANUAL

The aim of this manual is to ensure that you get the best reliability and performance from your SU 2000. Should a problem occur, you will be able to diagnose and rectify the fault as soon as possible with the minimum of down time.

Although every unit manufactured by Virtuality Entertainment Ltd is of a very high quality and undergoes a pre-delivery inspection, run-up and is tested for a minimum of 48 hours, faults can occur whilst machines are in transit or operated for great lengths of time without any preventative maintenance carried out by qualified personnel.

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AMENDMENTS

No.	DATE	INITIALS	No.	DATE	INITIALS
1	10-8-94	M.G.			

CONTENTS

I	COVER SHEET
II	INTRODUCTION
III	AMENDMENTS
IV	CONTENTS
SECTION 1	GENERAL INFORMATION
SECTION 2	MODULO PC
SECTION 3	FORMAT D AND CREDIT MODULE
SECTION 4	VISETTE® 2000
SECTION 5	SPACE JOYSTICK 2000
SECTION 6	TRACKING SYSTEM
SECTION 7	ENGINEERING TEST SYSTEM
SECTION 8	HELP DETAILS AND WARRANTY RETURNS PROCEDURE
SECTION 9	EMISSION TEST CERTIFICATE

SECTION 1
GENERAL INFORMATION

PAGE

1.1 Inspection and Routine Maintenance

1.2 Daily Inspection List

1.4 Dimensions and Specifications

1.5 Serial Numbers and Identification Panels

1.6 SU 2000 Exploded View

1.7 SU 2000 Parts List

1.8 Video and Audio Outputs

1.9 Recommended Service Tool Kit

1.10 Specialist Tools

1.11 Power Supply Connections

1.12 Distribution of Connections

SYSTEM 2000

MAINTENANCE

Hourly Inspections

Hourly inspections should be carried out by the operator on the Visette® Pads and Lenses. Lenses should be wiped clean with a soft dry lens cloth if required. Visette® Pads should be cleaned using moist medicated wipes ensuring you cover all areas in contact with the head and face. Do not use the moist wipes on the lenses as they can leave a residue.

Daily Inspections

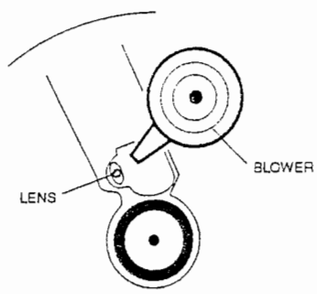
Daily inspections should be carried out every day prior to any public use by the trained operator to ensure complete safety of all users and equipment. A detailed daily inspection list has been provide in this manual and may be freely copied to be used by all operators. Any fault or damage should be reported immediately to enable repairs or adjustments to be made prior to public use.

Weekly Inspections

Check all Visette® cable entry plates, ensuring screws are not loose and where necessary, tightened or replaced. Ensure fan filters are checked and cleaned with a vacuum cleaner as required.

Regular Clean

The read lens in the CD ROM player should be cleaned regularly to avoid read errors. Press on the ROM drive front panel to unlatch it and gently pull the drawer out to it's full extent. Carefully lift up the top cover by grasping it at the sides, and remove the disk. Use a blower as shown to gently blow dust off the lens as shown. Never touch the the lens with fingers or any other object as this as may scratch the lens. If necessary fingerprints etc.can be removed by wiping the lens gently with a cotton swab. Replace the CD, close the lid and gently push the drawer back until it latches shut.



Regular Thorough Examination

Thorough examinations should be carried out every 4 months to ensure the reliability of equipment and the safety of users. The person appointed to carry out the thorough inspection should be independent of the owner, controller and operator of the device.
The appointed competent person should have such qualifications, knowledge, experience and supporting resources to enable them to make an assessment of the safety of the device including any associated equipment.

Service and Repairs

Service and repairs should only be carried out by an authorised service agent. Any warranty and maintenance agreement will be void if any other party conducts repairs, service or modifications to the equipment or software without prior authority from the supplier or manufacturer.

SYSTEM 2000

Daily Inspection Guide

1. The console should be carefully inspected for cracks or other damage.

2. The exterior surface should be cleaned and where necessary wiped with a damp cloth or a solution of mild detergent on a sponge or cloth. We recommend car bodywork ammonia type cleaning fluids. The surfaces should be wiped dry with a soft dry cloth prior to any public use. Chemical cleaning agents should not be used without prior advice from the manufacturer. Do not allow liquid to enter into any part of the equipment structure.

3. Check all external cables and connectors for damage and ensure they are secured and do not cause a tripping hazard.

4. Check all cables to the Visette® and Joystick for any sign of damage. These cables have an insulation sheath and it is important that there are no breaks in this protective layer, and they are free from all kinks.

5. Check that all access panels are correctly secured and keys removed.

6. Ensure that the disclaimer restriction sign is displayed in a prominent position and legible.

7. Check the casing and foam pads on the Visette® and Joystick for any damage. Dirty, torn or damaged pads should be replaced to ensure maximum comfort and safety of all users.

8. Check that all the controls and adjustments on the Visette® are functioning correctly.

9. Check the operation of the Joystick buttons.

10. Check the external speaker and set the appropriate level to suit the environmental conditions.

11. Check the Visette® internal screens are operational. Ensure the alignment is set correctly and the brightness is equally balanced using ETS. (If any misalignment is observed, ensure a qualified engineer is allowed to re-align the system.)

12. Check correct operation of the Visette® and Joystick tracker systems using ETS or in an Experience. **NOTE:** the tracker does not operate in demo mode.

14. Ensure that the access and surrounding areas of the console are free of obstructions likely to cause a tripping hazard. Check the Visette® and joystick cables are not presenting a tripping hazard.

SYSTEM 2000

DIMENSIONS AND SPECIFICATIONS

Power consumption	600W MASTER 60W SLAVE 500W SINGLE
Temperature	10° to 35°C
Humidity	0% to 85%
Voltage Fuse	220V to 240V or 110V (switchable) 5 amp anti-surge
Footprint	1450mm x 1200mm (single machine) 3960mm x 1200mm (twin player set up)
Console height Maximum height	1340mm 1590mm (including Visette® 2000)
Weight	130kg (single unit) 105kg (slave unit)

WARNING: THESE UNITS MUST BE EARTHED.

Location of equipment

The SU 2000 console requires approximately 2 metres square of solid flat surface for safe operation. This area must be clean and dry with a recommended ceiling height of at least 2.6 metres to enable correct operation of the tracker system. If the ceiling contains large areas of metal, a ceiling height of at least 4 metres is recommended to avoid tracker interference.

The console should not be stored or operated out of doors unless there is sufficient weather protection to prevent the ingress of water from rain or condensation into any part of the console. The console should not be located in direct sunlight as this could cause overheating of the Visette® and Modulo PC computer resulting in damage to the internal components.

To prevent interference of the tracker system by external equipment, ensure that a radius of 2 metres around the console does not contain large metal objects or equipment emitting electromagnetic radiation (e.g. monitors, lighting equipment, large speakers etc.).

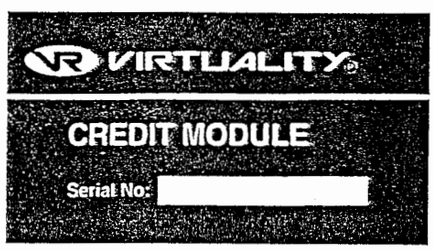
VIRTUALITY®

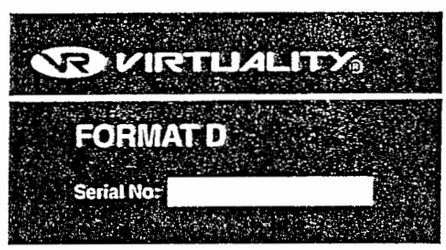
SYSTEM 2000

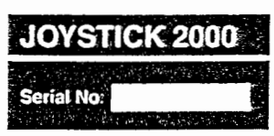
SERIAL NUMBERS AND IDENTIFICATION PANELS

When communicating with Virtuality Customer Service department, please be sure to quote the machine serial number and where applicable, sub-assembly serial numbers.

Each sub-assembly which makes up the main console can be identified with a smaller identification plate:



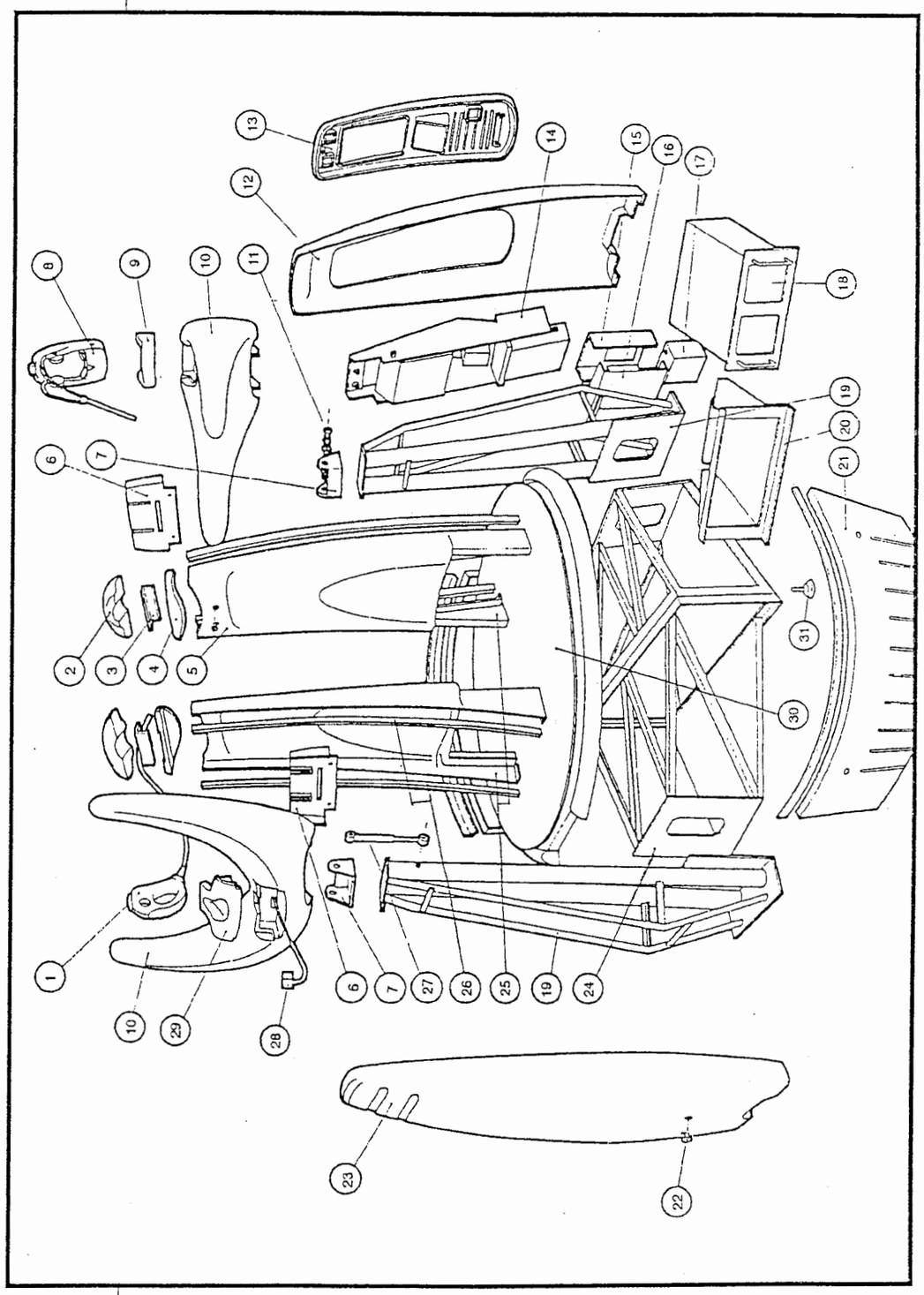




The Modulo PC can be identified by it's own label:

SYSTEM 2000

VIRTUALITY®



AMENDMENT No. 1

SYSTEM 2000

No.	DESCRIPTION	PART No.	QTY
1	SPACE JOYSTICK 2000		1
2	CABLE COVER UPPER	238-139-01	2
3	CABLE MANAGER	238-133-01	2
4	CABLE COVER LOWER	238-140-01	2
5	INNER PANEL UPPER	238-020-04	2
6	FINGER GUARD	238-141-01	2
7	HINGE	238-050-03	2
8	VISETTE® 2000	OA VISETTE 2000 ASSY	1
9	VISETTE® HOLSTER BAND	238-028-03	1
10	RING-HALF	238-005-02	2
11	HINGE ADJUSTER	238-051-02	2
12	CREDIT PANEL	238-045-02	1
13	BEZEL	238-012-02	1
14	CREDIT MODULE	OA CREDIT MOD ASSY	1
15	PSU COVER	238-059-04	1
16	PSU BASE	238-058-05	1
17	PSU	OA PSU ASSY	1
18	MODULO PC COMPUTER	OA MODULO PC ASSY	1
19	TOWER	238-006-08	2
20	COMPUTER TRAY	238-008-03	1
21	INFILL PANEL	238-024-02	2
22	LOCK	238-501	10
23	OUTER PANEL (PLAIN)	238-021-02	1
24	LOWER FRAME	238-007-04	1
25	INNER PANEL LOWER	238-039-01	2
26	PANEL EXTRUSION	238-032-02	6M
27	GAS STRUT	238-510	1
28	INSIDETRAK TRANSMITTER	239-502T	1
29	JOYSTICK HOLSTER	238-029-03	1
30	RUBBER MAT	238-023-01	1
31	FEET	238-511	6

AMENDMENT No. 1

SYSTEM 2000

VIDEO OUTPUT

Type:

1V composite video when terminated by 75 Ohms 0.3V sync, 0.7V video

PAL timing

64µs line sync; 50Hz frame rate

75 Ohms output impedance

B.N.C. connector

Maximum cable length 30 Metres

NOTE: If more than one video output is required, a buffer amplifier must be used.

FORMAT C LINE AUDIO OUTPUT

Type:

1V stereo line output

100 Ohms output impedance

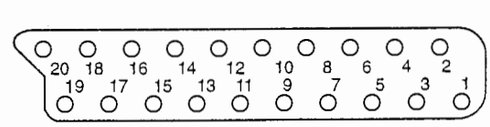
3.5mm stereo jack socket connector

This output will drive either 32 Ohm headphone directly or any high input impedance.

Maximum cable length 5 Metres.

PIN	SIGNAL
20	VIDEO INPUT
17	VIDEO COMMON (SCREEN)
2	AUDIO INPUT
4	AUDIO GROUND
7	INPUT BLUE
11	INPUT GREEN
15	INPUT RED
16 ⌐ 20 ⌙	INPUT SYNC
17	GROUND

SCART CONNECTOR



REAR VIEW OF SCART PLUG

SYSTEM 2000

RECOMMENDED SERVICE TOOL KIT

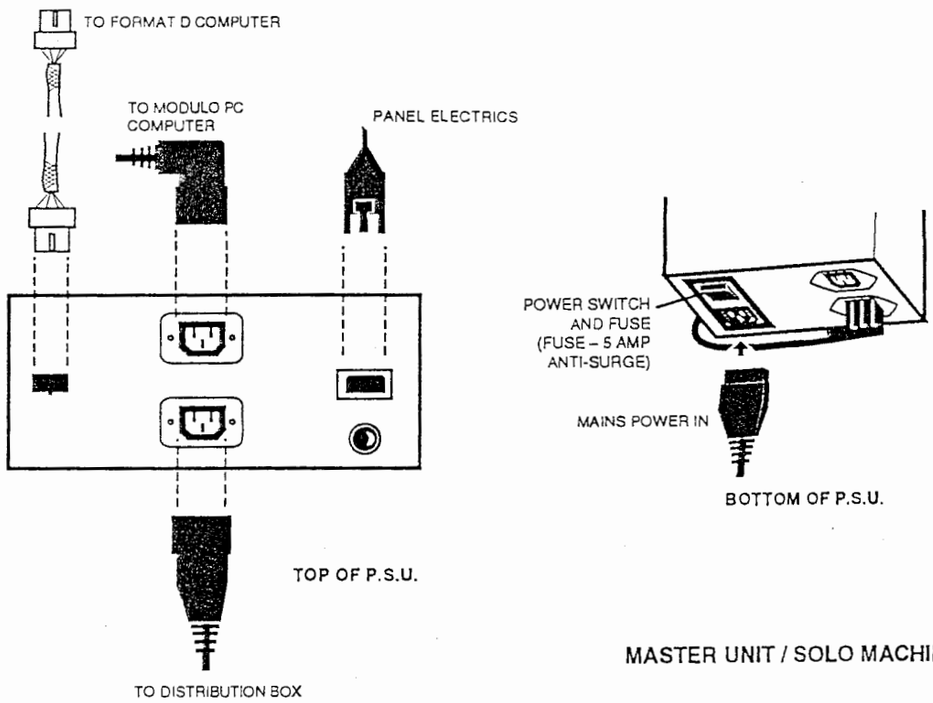
VIRTUALITY®

1. Mains Soldering Iron
2. Desolder Pump
3. Solder
4. Soldering Aids
5. Glass Fibre Pencil
6. Pointed Tweezers
7. Needle Files
8. 6" Adjustable Spanner
9. Metric Allen Key Set
10. 6" Steel Rule
11. Neon Mains Test Screwdriver
12. Cutter - Diagonal
13. Snipe Nose Pliers
14. Combination Pliers
15. Wire Stripper
16. Trimming Tools
17. Jewellers Screwdriver - Cross Point
18. Jewellers Screwdriver - Flat Blade
19. Pozidrive Screwdriver - No 0
20. Pozidrive Screwdriver - No 1
21. Pozidrive Screwdriver - No 2
22. Flat Blade Screwdriver Set
23. Nut Runner Set - Metric
24. 0 - 8 BA Spanner Set
25. 4 - 11mm Spanner Set
26. Anti-static Strap & Wrist Band
27. Scissors
28. Thread Studlock

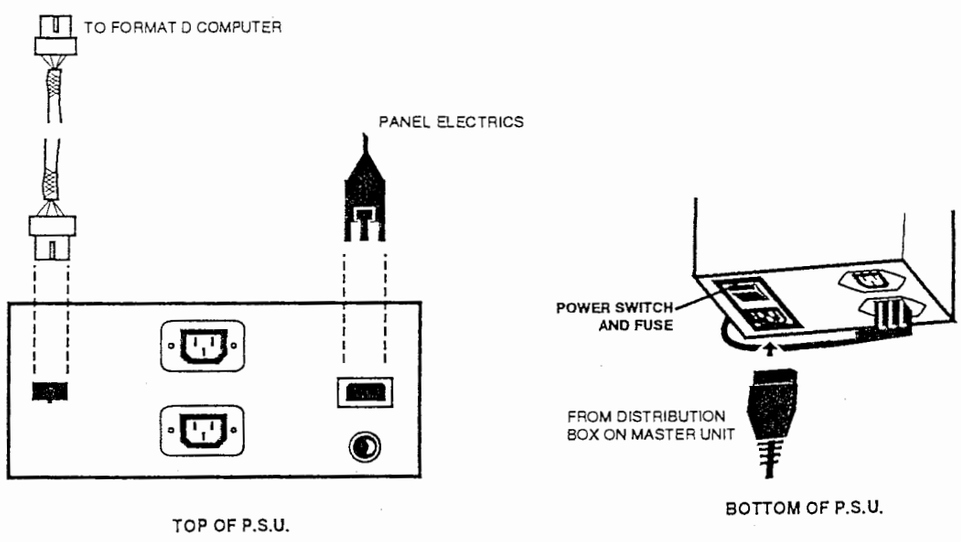
RECOMMENDED SPECIALIST TOOLS

29	819 Key
30.	Ball Ended Allen Driver - 2.0mm
31.	Ball Ended Allen Driver - 2.5mm
32.	Ball Ended Allen Driver - 3.0mm
33.	Ball Ended Allen Driver - 4.0mm
34.	Ball Ended Allen Driver - 5.0mm
35.	Large Pipe Wrench
36.	Small Pipe Wrench
37.	Digital Multimeter
38.	Black Insulating Tape
39.	Miniature Torch
40.	75 Ohm Coax. Crimp Tool
41.	50 Ohm Coax. Crimp Tool
42.	Right Angled Flat Screwdriver
43.	Right Angled Cross Screwdriver
44.	Precision Wire Stripper
45.	Harwin Pin Extraction/Insertion Tool
46.	Miniature Hand Drill
47.	Video Card Test Lead
48.	75 Ohm BNC to 6W Harwin Test Lead
49.	9-Way D-Type Plug and Socket
50.	15-Way D-Type Plug and Socket
51.	25-Way D-Type Plug and Socket
52.	17-Way 2 D-Type Plug and Socket
53.	Harwin Crimp Tool
54.	1mm Allen Key
55.	Lens Cloth
56.	Headphones

CONNECTIONS TO POWER SUPPLY UNITS



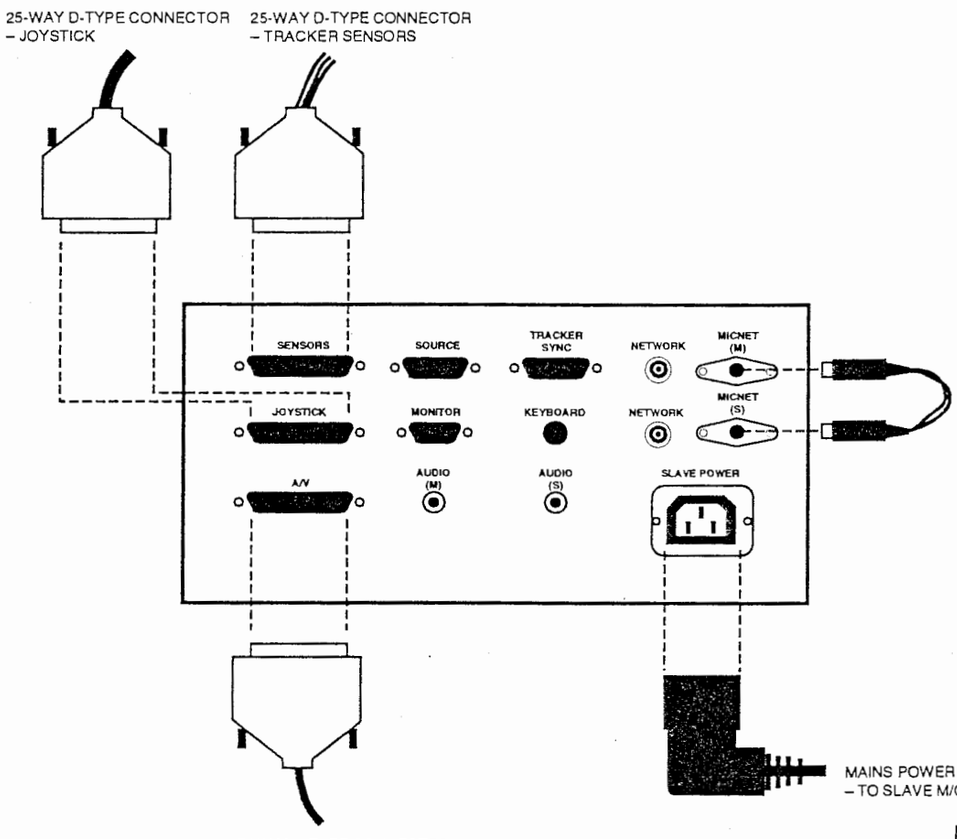
MASTER UNIT / SOLO MACHINE



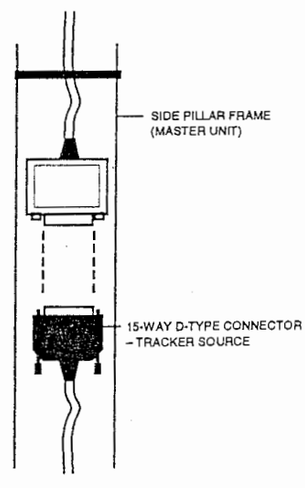
SLAVE MACHINE

RECONNECTING THE MASTER DISTRIBUTION BOX

If the Master Distribution box, (situated on the base frame of the master unit in a two player system), has been disconnected for transportation, the diagram below shows the positions of the various reconnections which will have to be made.



NOTE: THE TRACKER SOURCE CABLE CONNECTS TO A SOCKET SITUATED ON THE SIDE PILLAR FRAME ON THE MASTER UNIT



SECTION 2

MODULO PC COMPUTER

PAGE

2.1 Modulo PC – Exploded View (front)

2.2 Modulo PC Parts List (front)

2.3 Modulo PC – Exploded View (rear)

2.4 Modulo PC Parts List (rear)

2.5 Equipment Overview

2.10 Modulo PC Card Positions

2.11 Input/Output Connections

2.12 Reconnecting the Modulo PC Computer

2.13 Format C – Basic Specifications

2.14 – 2.22 PCB Jumper Settings

- 2.14 VGA Graphics Card
- 2.14 Network Card
- 2.15 486 CPU Card
- 2.16 Format C Card Player 1
- 2.17 Format C Card Player 2
- 2.18 InsideTRAK™ Card Player 1
- 2.19 InsideTRAK™ Card Player 2
- 2.20 Graphics Processor Card Player 1
- 2.21 Graphics Processor Card Player 2
- 2.22 Video Card

2.23 Cable for Vocalizer/Micnet Distribution Box

2.24 Boot-up Troubleshooting Flowchart

SYSTEM 2000

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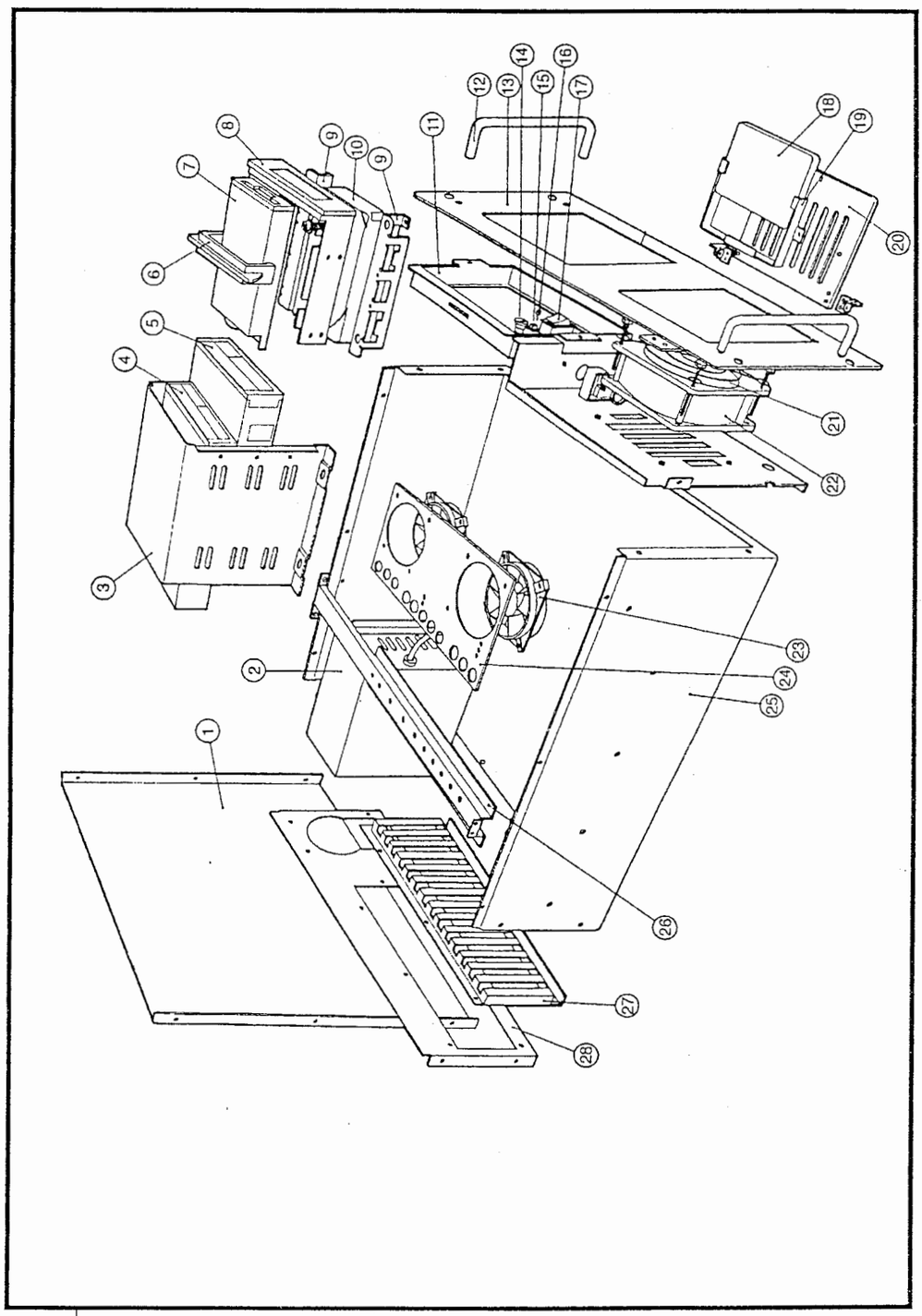

AMENDMENT No. 1

SYSTEM 2000

ITEM	DESCRIPTION	QTY	PART No
1.	19" RACK COVER	1	239-504*
2.	P.C. P.S.U.	1	238-507
3.	DISK DRIVE CAGE	1	239-504*
4.	MASTER CD ROM DRIVE	1	239-510
5.	SLAVE CD ROM DRIVE	0(1)	239-510
6.	FLOPPY DRIVE MOUNTING BRACKET	1	239-504*
7.	FLOPPY DRIVE	1	239-506
8.	FLOPPY DRIVE FACIA	1	239-506
9.	HARD DRIVE MOUNTING BRACKETS	2	239-504*
10.	HARD DISK DRIVE	1	239-507
11.	DISK DRIVE CAGE FRAME	1	239-504*
12.	RACK HANDLE	2	239-504*
13.	RACK FRONT PANEL	1	239-504*
14.	KEYBOARD LOCK SWITCH	1	239-504*
15.	RESET SWITCH	1	239-504*
16.	HARD DISK ACCESS LED	1	239-504*
17.	POWER SWITCH	1	239-504*
18.	REMOVABLE AIR FILTER	1	239-504*
19.	FILTER MOUNTING BRACKET	1	239-504*
20.	FRONT FAN DOOR	1	239-504*
21.	FAN FINGER GUARD	1	239-504*
22.	FRONT FAN	1	239-504*
23.	TOP COOLING FANS	2	MIS 00195
24.	TOP FAN BRACKET	1	239-504*
25.	19" RACK CASE	1	239-504*
26.	P.C.B. HOLD DOWN CLAMP	1	239-504*
27.	P.C.B. GUIDE RAIL	1	239-504*
28.	19" RACK REAR PANEL	1	239-504*

* All part of 19" rack –300 PC Chassis.

NOTE: Figures in brackets refer to Master and Slave (2 Player) set up.

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SYSTEM 2000

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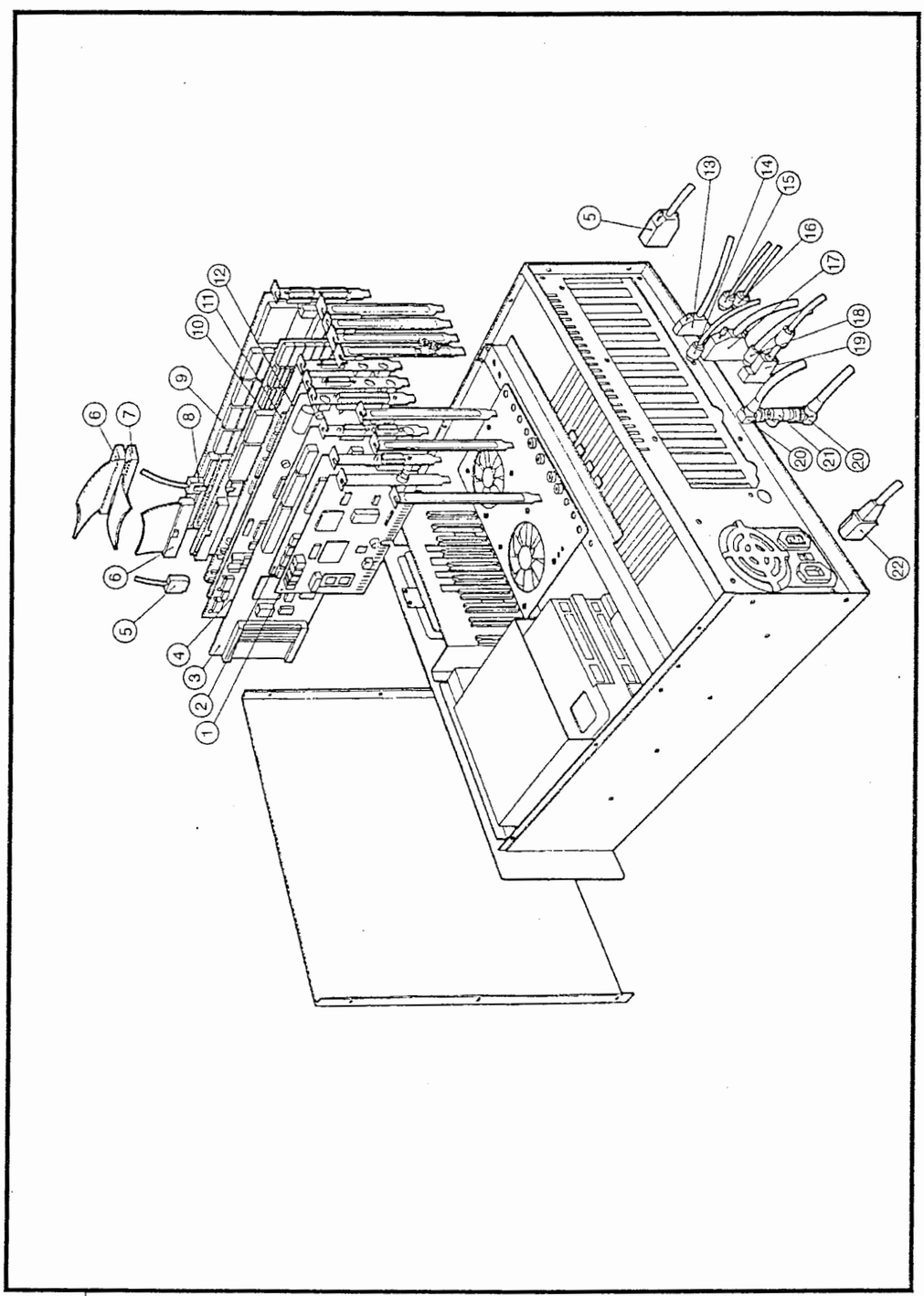

VIRTUALITY®

SYSTEM 2000

ITEM	DESCRIPTION	QTY	PART No
1.	ETHERNET CARD	1	239-509
2.	SVGA CARD	1	239-512
3.	SC486 DX33 CARD	1	239-516
4.	FORMAT C CARD	1(2)	239-519
5.	VIDEO CARD O/P LEAD (RGB)	1(2)	239-003
6.	GRAPHICS CARD IDC LEAD	1(2)	238-082
7.	GRAPHICS CARD IDC LEAD (SLAVE)	1	238-082
8.	GRAPHICS CARD POWER CABLE	1	238-083
9.	VIDEO CARD	1	239-501-02
10.	GRAPHICS PROCESSOR CARD	1(2)	239-500-02
11.	SLAVE INSIDETRAK CARD	0(1)	239-502PCB
12.	MASTER INSIDETRAK CARD	1	239-502PCB
13.	CONNECTION FOR TRANSMITTER FREQUENCY MODULE	1(2)	239-520/COLOUR
14.	MICNET INT CABLE	1(2)	238-070
15.	VISETTE SENSOR CABLE - MASTER	1	238-060-01
	VISETTE SENSOR CABLE -SLAVE	0(1)	238-073-01
16.	JOYSTICK SENSOR CABLE - MASTER	1	238-060-01
	JOYSTICK SENSOR CABLE - SLAVE	0(1)	238-073-01
17.	FORMAT C1-D1 A/V LEAD - MASTER	1	238-061-02
	FORMAT C2 A/V LEAD - SLAVE	0(1)	238-072-02
18.	KEYBOARD MINI-DIN CONNECTOR	1	
19.	SVGA 15-WAY HIGH DENSITY CONNECTOR	1	
20.	ETHERNET CABLE	2	238-063
21.	ETHERNET T-PIECE	1	MIS 00104
22	IEC POWER CABLE	1	

NOTE: Figures in brackets refer to Master and Slave (2 Player) set up.

SYSTEM 2000

Modulo PC is a multi-processor computer system developed by Virtuality Entertainment Ltd as a low cost, high performance engine to provide Computer Generated Images and multi-channel sound and motion outputs for the Virtuality® System 2000. Mass storage is provided using CD ROM and hard disk to enable the use of large data bases for the experiences provided. This fully integrated computer system is used by the VPC simulation software to generate the Virtuality® experiences and contains a local area network facility to enable groups of Virtuality® systems to be connected for multi-user participation.

Access to the Modulo PC unit

The Modulo PC unit is located in the base of the console, seated in a special frame which swings out to provided access to the computer once the side GRP panel has been removed.

Installation Specifications

Power requirements	230 w
Temperature	10°C to 35°C
Humidity	15% to 95% no condensation
Voltage	220 – 240V or 110V AC
Size	480mm x 470mm x 175mm
Weight	19Kg (42lb)
P.S.U. Fuse	6amp Q.B. 20mm

The Virtuality® SU 2000 system has been designed with modularity in mind and is based on the PC ISA bus. For a single player machine, the following expansion cards are required:

1. Graphics Processor Card – The processor card uses 2 Motorola 88110 Graphics RISC processors to manipulate and generate the screen data for the Visette. The 88110's are advanced symmetric superscaler graphics engines, capable of delivering a peak performance specification of 200 MIPs.
   The processors share 8 Megabytes of DRAM and 4 Megabytes of VRAM. A 2K by 16 bit FIFO is used as a communications interface between the PC and RISC processors. All the RISC processor memory can be accessed by the PC via a dual port interface.
   A separate video bus connector is used to transfer video data from the processor VRAM to the video card.
   Multiple processor cards can be linked to the same video bus, allowing a truly scaleable architecture for increasing graphics processing power.

2. Video Card – The video card has two input video buses and it synchronises and controls this video data into a line store buffer before outputting it in RGB format.

The card also generates broadcast quality sync timings for generation of PAL/NTSC video timing signals.
There are several modes of operation which include 32 bit video data, 16 bit video data, dual mono video and stereoscopic video. The video card can control up to 16 processor cards for graphics intensive applications.

3. Tracker Card – This is the realtime position tracker board which provides the absolute position and angle data on where the joystick and headset are located in space.

4. Format C Card – This card incorporates all the electronics for the CD ROM interface, FM synthesis, audio sampling and audio mixing for all signals, including the headset and microphones. The card also converts the video data into a composite format suitable for the Visette® and provides the timing for the control signal necessary for back-lighting to the Visette®.

5. Format D Card – This card is external to the PC system (it is housed below the Credit Module) and acts as an integrator for all the connectivity required to the peripherals.

A two player SU 2000 system using the above PC cards would also require:

1 additional Graphics Processor card
1 additional Tracker card
1 additional Format C card
1 additional CD ROM

Inspection

Before connecting power to the Modolo PC computer a careful examination should be made of the casing, particularly the front panel where the media has to be loaded. All plugs and sockets should be examined for damage and foreign bodies e.g. solder splashes or swarf.

Power plugs and sockets should be examined for damage and replaced if any are found damaged.

Power cables should be examined for damage.

Fuses should be checked for the correct rating. These are 5amp anti-surge type and are located in the power supply box below the credit module.

SYSTEM 2000

Power Inputs and Fuses

Power to the unit is by a power lead through a plug and socket on the rear panel. The power cable should be protected at the sending end by a 2amp fuse. There are no user servicable internal fuses within the Modulo PC cabinet.

Switch Positions

The unit is switched on using the ON/OFF switch on the front panel

Floppy Disk Unit

The floppy disk drive is located to the right of the front panel. This is used for loading programs and data into the computer, or on to the hard disk.

Hard Disk Unit

The hard disk drive is situated below the floppy disk drive. The unit is a 120 Megabyte hard drive configured as a single default C partition.. The operational software and some diagnostics are stored on the hard disk and read into the computer as required.

CD Rom Unit

The CD Rom unit is located above the floppy disk drive and is loaded with a CD through a panel on the front of Modulo PC. The CD ROM and floppy disk units are covered by a transparent door to keep dust and dirt away from the playing surfaces. The CD has 533 Megabytes of storage available which can be used for music, sounds, spoken instructions, bitmaps or computer programs.

NOTE: If the console is a MASTER system - used with a SLAVE unit to run a two player system, a second CD ROM player is present. The CDs must be left in place for the system to run, but should be removed for shipping purposes.

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SYSTEM 2000

Access to the Computer PCBs

Access to the PCBs within the computer case is obtained by removing the top cover of the Modulo PC. The unit should be disconnected from the mains supply before removing the cover because there are live mains terminals inside and therefore a risk of electric shock.

Removal of PCBs

NOTE: Anti-static precautions **MUST** be taken at all times when handling PCBs. Use **an earthing strap.**

Care should be taken when handling the PCBs soon after the machine has been in use because the components can be very hot.

SYSTEM 2000

The hard disk drive, floppy disk drive and CD ROM player(s) are all situated in the drive bay chassis on the right of the computer case at the front. The hard disk drive resides at the bottom, the floppy drive unit is above this and the CD ROM player on the top. In the case of a master Modulo PC unit for a two player set up, an additional CD ROM drive is present and lives above the other units. To remove any of the units contained in the drive bay, the chassis must first be removed by undoing the four retaining bolts securing it to the computer casing. The chassis can then be carefully lifted clear of the casing and the appropriate unit removed.

Removal of Floppy Disk Drive

To remove the floppy disk drive, the chassis containing the CD Rom player and the floppy disk unit must be taken out as above. The floppy disk unit is held in a sub-frame which also holds the hard drive unit sub-frame. The four retaining screws at the side of the chassis can then be removed and the floppy disk unit removed from the chassis. To separate the hard and floppy drive units, remove the two large retaining bolts which fasten the two sub-frames together.

Removal of the Hard Disk

The hard drive unit can only be removed by first taking out the floppy drive unit and then separating the two drive sub-frames as detailed above.

Removal of the CD Drive

The CD drives are mounted on the subframe which also contains the floppy disk drive. Undo the four retaining screws at the side of the chassis and the CD ROM drive can be carefully removed.

SYSTEM 2000

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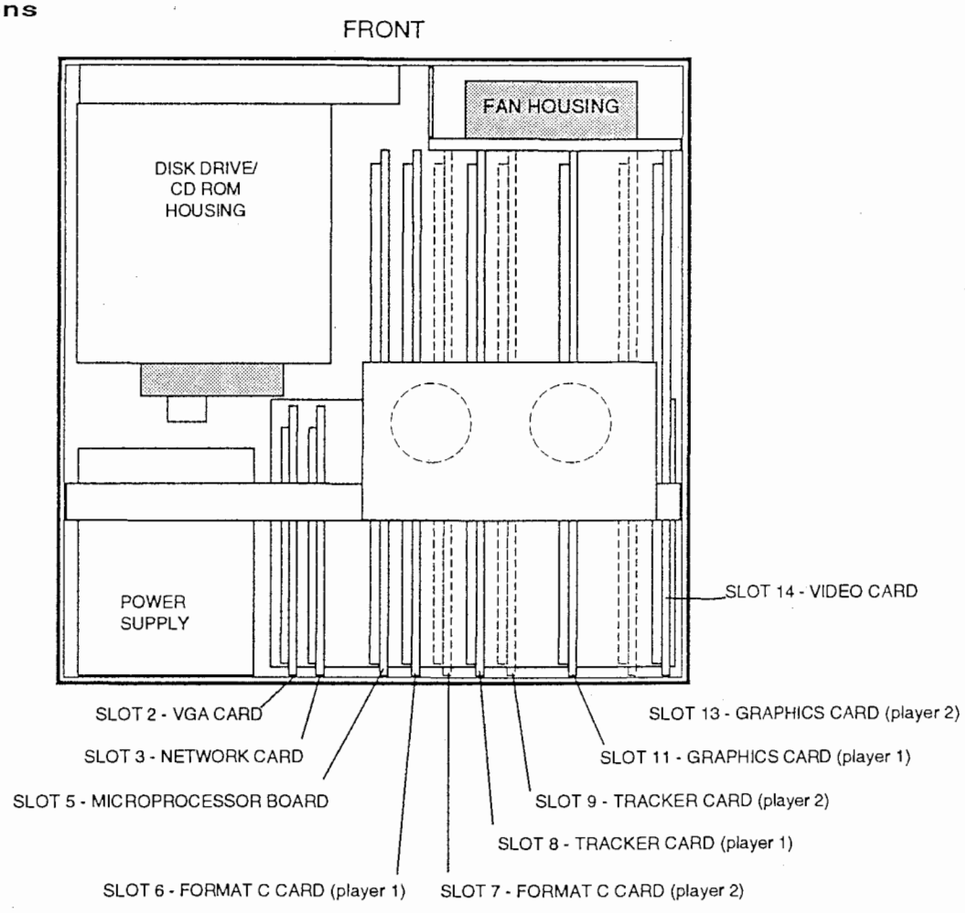
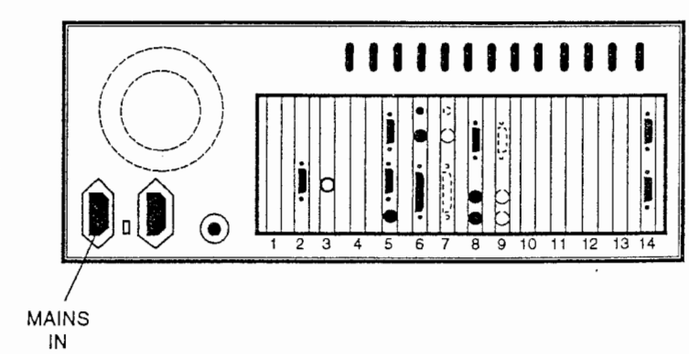

FRONT
FAN HOUSING
DISK DRIVE/
CD ROM
HOUSING
POWER
SUPPLY
SLOT 14 - VIDEO CARD
SLOT 2 - VGA CARD
SLOT 3 - NETWORK CARD
SLOT 5 - MICROPROCESSOR BOARD
SLOT 6 - FORMAT C CARD (player 1)
SLOT 7 - FORMAT C CARD (player 2)
SLOT 8 - TRACKER CARD (player 1)
SLOT 9 - TRACKER CARD (player 2)
SLOT 11 - GRAPHICS CARD (player 1)
SLOT 13 - GRAPHICS CARD (player 2)

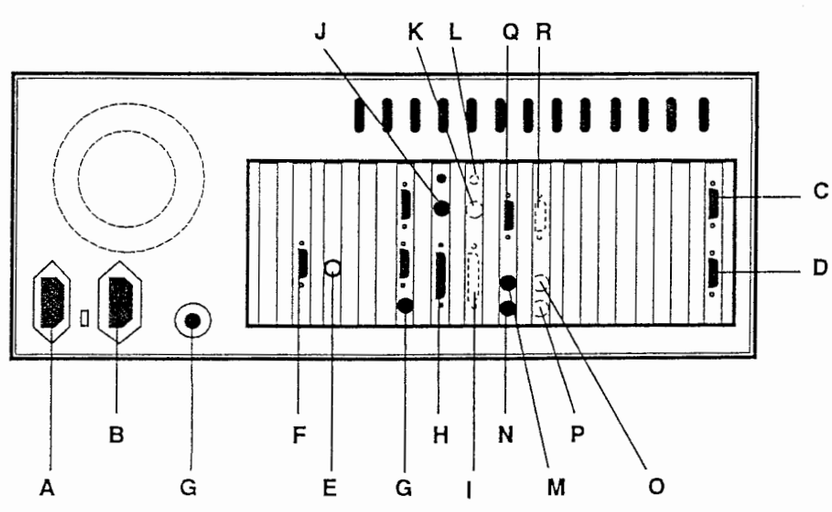
PLAN VIEW



REAR VIEW

The rear panel of the Modulo PC has the following input output connections:-

A	**Mains Power Lead**
B	**Power Lead** – computer to monitor
C	**9-way D-type Socket** – video card; Player 2 output
D	**9-way D-type Socket** – video card; Player 1 output
E	**BNC Video Socket 50 ohms** – network card
F	**9-way D-type Socket** – VGA card
G	**Keyboard Socket** (Either – depending on computer motherboard type)
H	**25-way D-type Socket** – Format C card; player 1
I	**25-way D-type Socket** – Format C card; player 2 (if applicable)
J	**8-Way Mini-din socket** – Format C card; player 1
K	**8-Way Mini-din socket** – Format C card; player 2 (if applicable)
L	**Stereo Jack Plug** – not normally connected
M	**6-way Mini-din Socket** – Tracker Card; player 1
N	**6-way Mini-din Socket** – Tracker Card; player 1
O	**6-way Mini-din Socket** – Tracker Card; player 2 (if applicable)
P	**6-way Mini-din Socket** – Tracker Card; player 2 (if applicable)
Q	**9-way D-type Socket** – Tracker Card; player 1
R	**9-way D-type Socket** – Tracker Card; player 2 (if applicable)



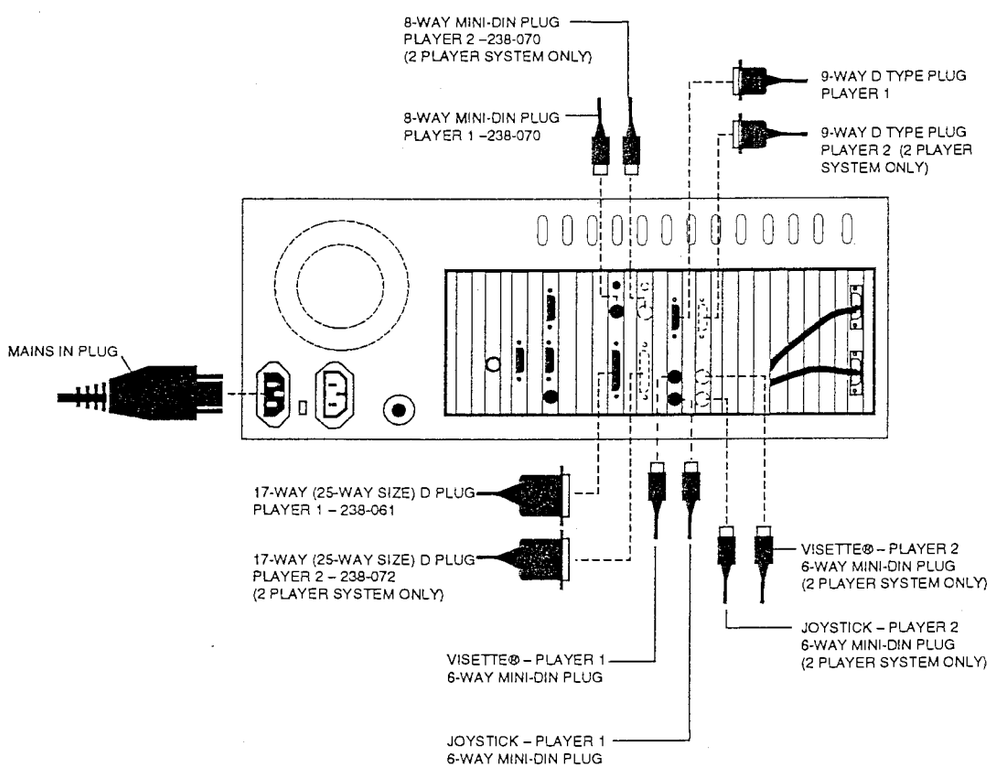
REAR PANEL OF MODULO PC

SYSTEM 2000

RECONNECTING THE MODULO PC COMPUTER

If the Modulo PC computer has been removed for transportation, the diagram below shows the positions of the various reconnections which will have to be made.

The 2 remaining leads terminating in BNC video connectors are for networking the machine(s) to provide a four player set up.

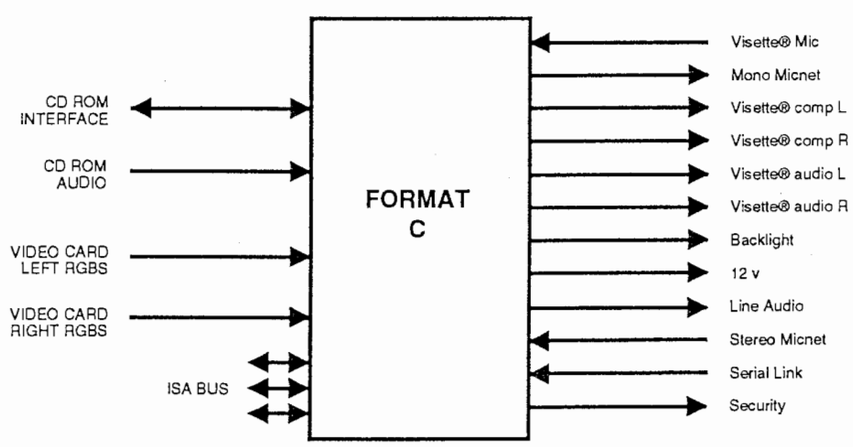


SYSTEM 2000

FORMAT C – BASIC SPECIFICATIONS

I/O Information

- ISA Bus
- CD Audio Input
- Mitsumi CD ROM Interface
- Mono Micnet Output
- Stereo Micnet Input
- Visette® Microphone Input
- Visette® Composite Output L/H& R/H
- Visette® Audio Output L/H & R/H
- Line Audio Output
- Security Input
- Backlight Output
- Serial Bus to Format D
- 12v Output to Visette®



Audio

Provides an audio sample with up to 8 Mbytes of RAM, populated with 4 Meg.

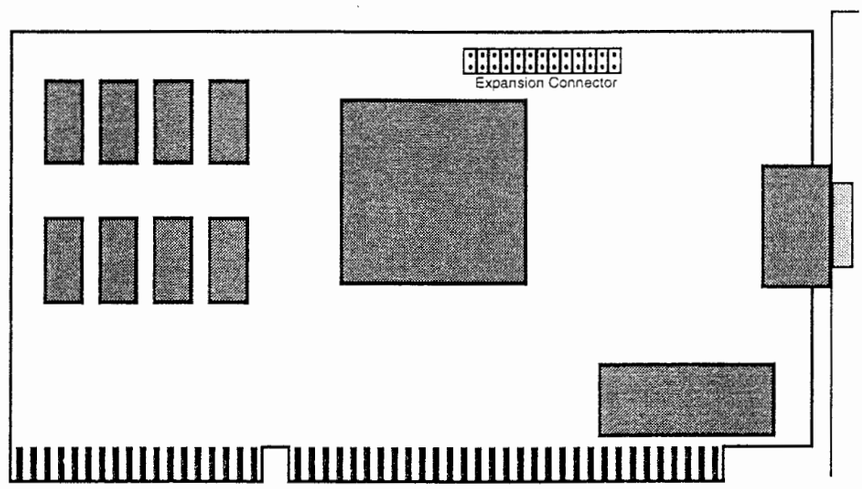
FM sound synthesis

4 Mbytes for sound FX

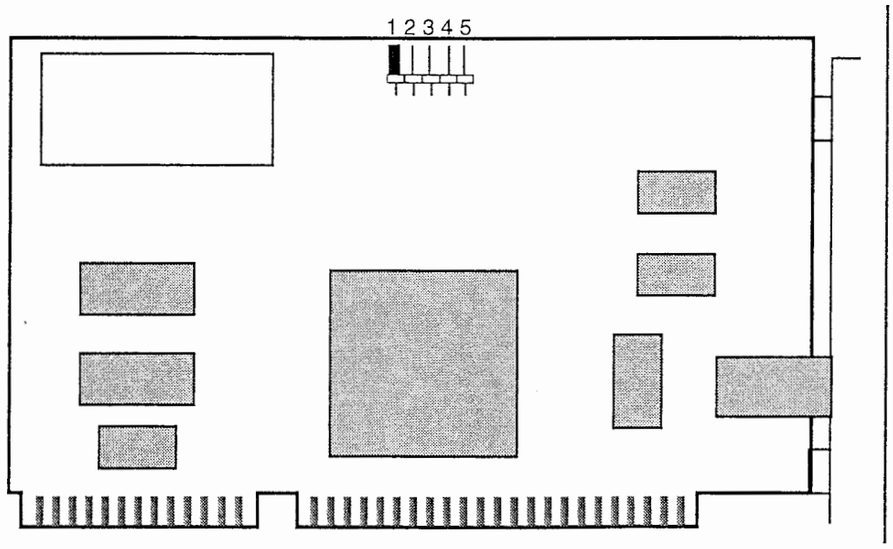
MIDI is opto isolated and provides IN, OUT & THRU

IF ANY P.C.B.s HAVE TO BE REPLACED OR SWAPPED FOR FAULT DIAGNOSIS, THE APPROPRIATE JUMPERS MUST BE SET FOR CORRECT OPERATION.

OBSERVE ANTI-STATIC PRECAUTIONS.



VGA Graphics Card (No Jumper Settings)



Network Card Jumper Settings

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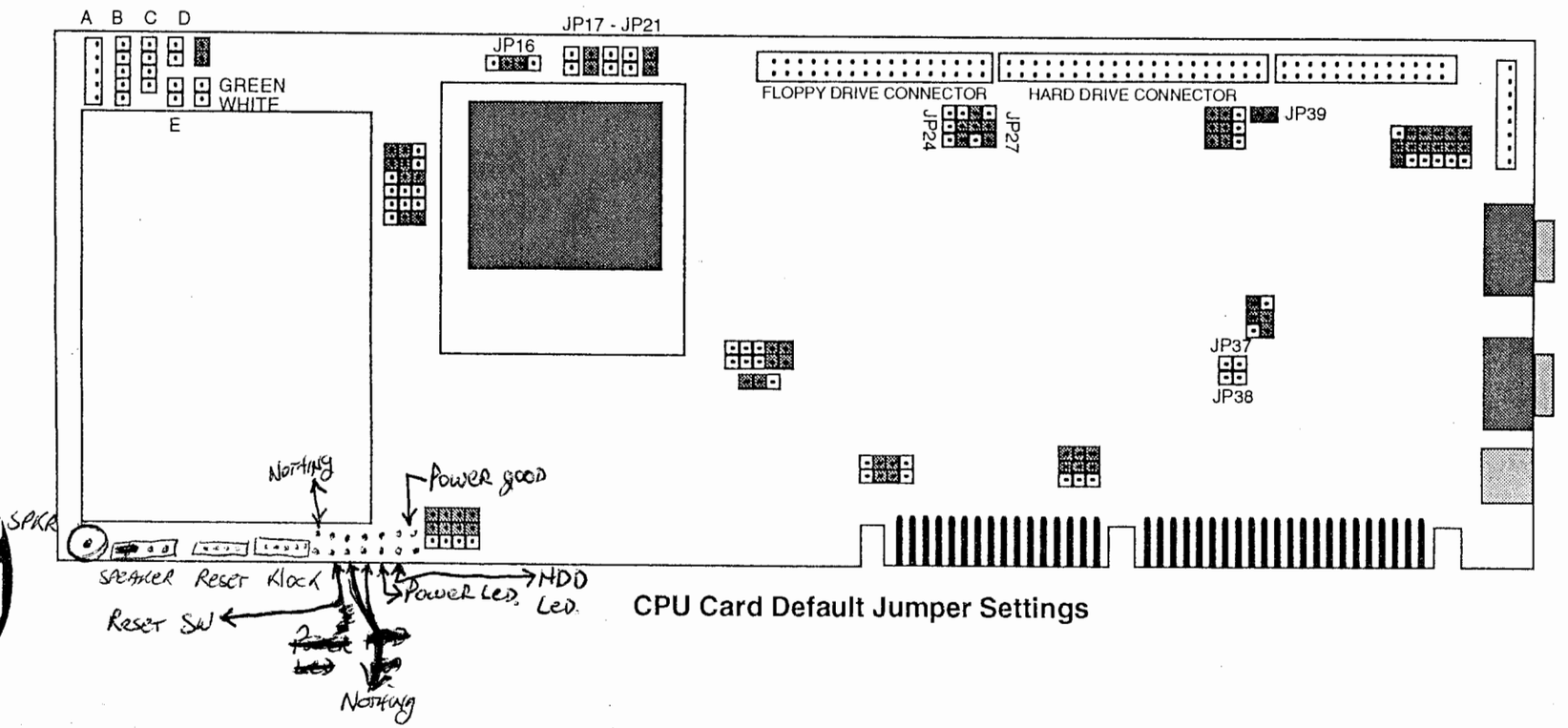
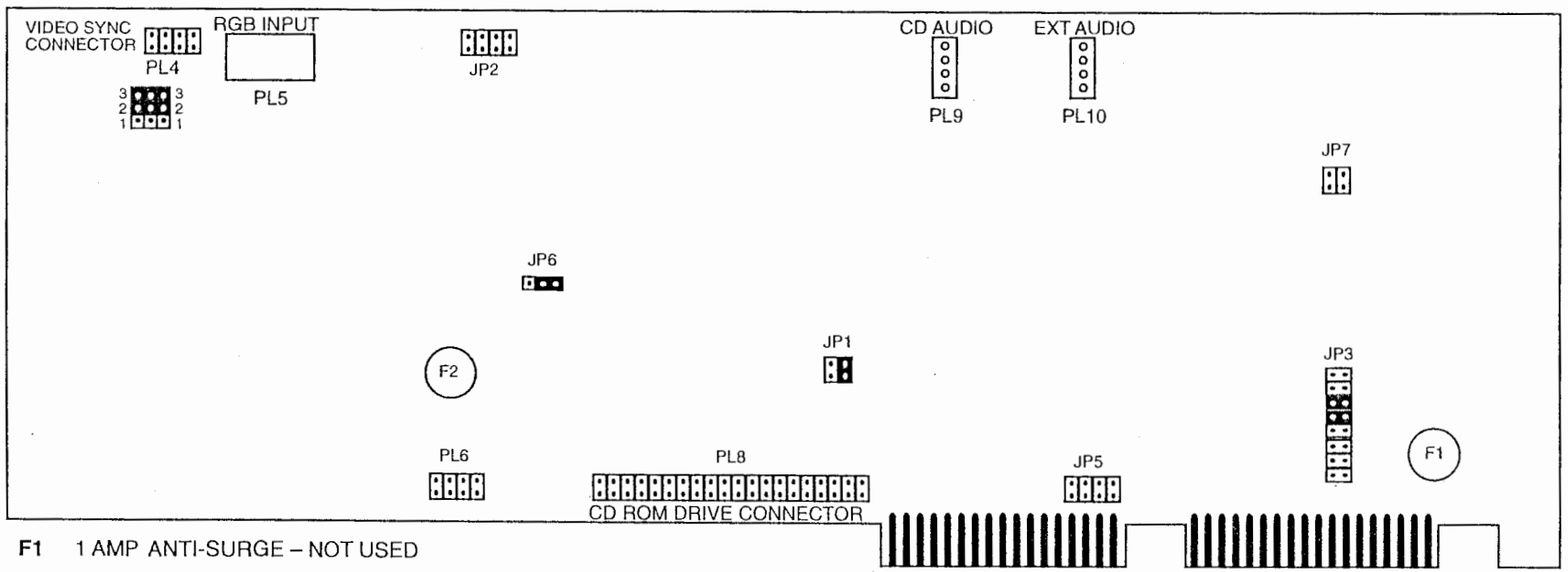
- Socket 7 - 75, 100, 133, 166 etc. Speed CPU's -
- Need Jumper Settings for -
Award Modular BIOS v4.51PG, An energy Star Ally Copyright (c) 1994-97, ~~Award Software, Inc.~~

INTERNAL CABLE CONNECTIONS
A – KEYBOARD CONNECTOR
B – KEYLOCK
C – SPEAKER (TOP = RED)
D – RESET (TOP =RED)
E – HARD DISK LED (TOP = RED)



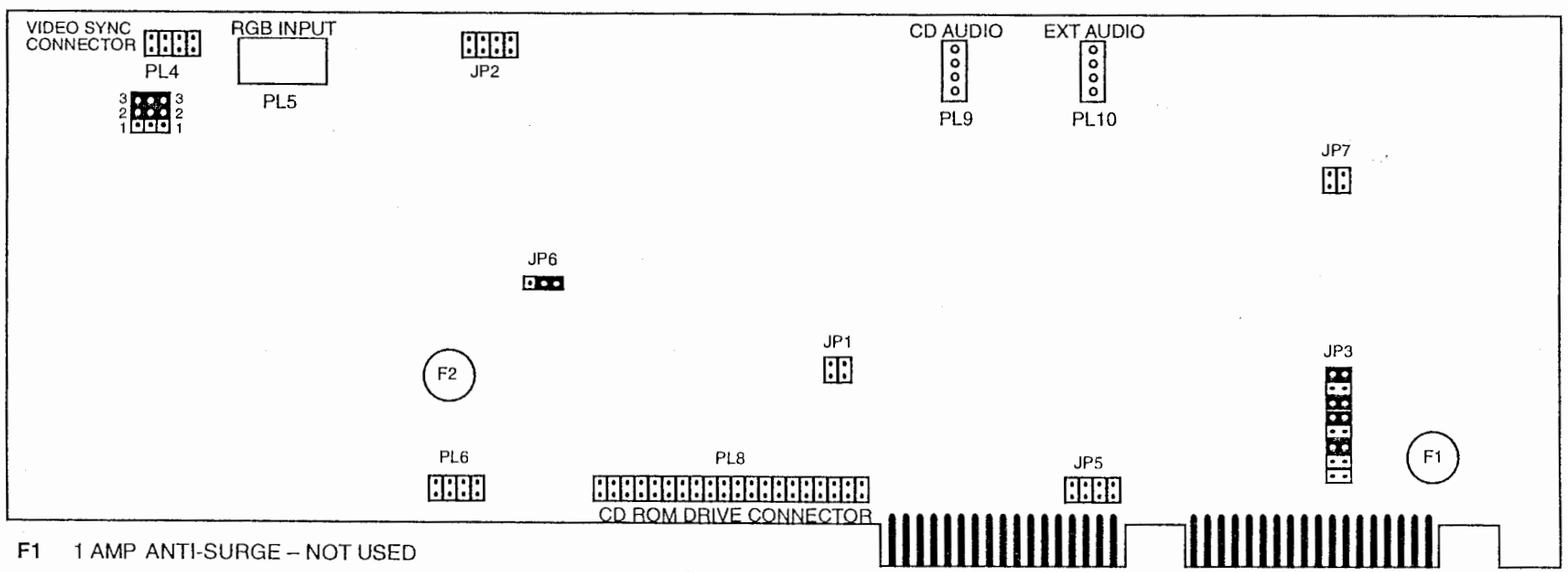
CPU Card Default Jumper Settings



F1 1 AMP ANTI-SURGE – NOT USED

F2 1 AMP ANTI-SURGE – NOT USED

Format Card Player 1 Jumper Settings



F1 1 AMP ANTI-SURGE – NOT USED

F2 1 AMP ANTI-SURGE – NOT USED

Format Card Player 2 Jumper Settings

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InsideTRAK Player 1 Jumper and Switch Settings

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InsideTRAK Player 2 Jumper and Switch Settings

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Graphics Processor Board Default Jumpers (Player 1)

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SYSTEM 2000

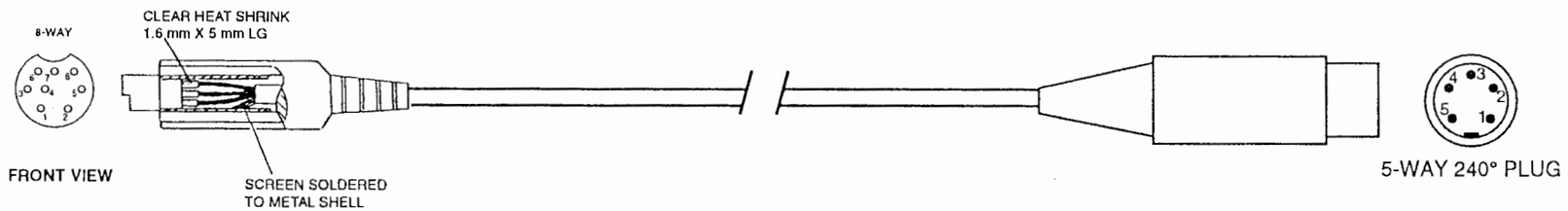
Graphics Processor Board Default Jumpers (Player 2)

AMENDMENT No. 1

9-WAY D-SOCKET		
PIN No.	COLOUR	COMMENTS
1	WHITE/BLUE	R
2	WHITE/GREEN	G
3	WHITE/ORANGE	B
4	WHITE/BROWN	SYNC
6	BLUE	
7	GREEN	
8	ORANGE	
9	BROWN	

Default Dual Channel Video Jumper Settings

F1 – 1 AMP BEAD FUSE FUS 00012
PROTECTING +12V D.C.

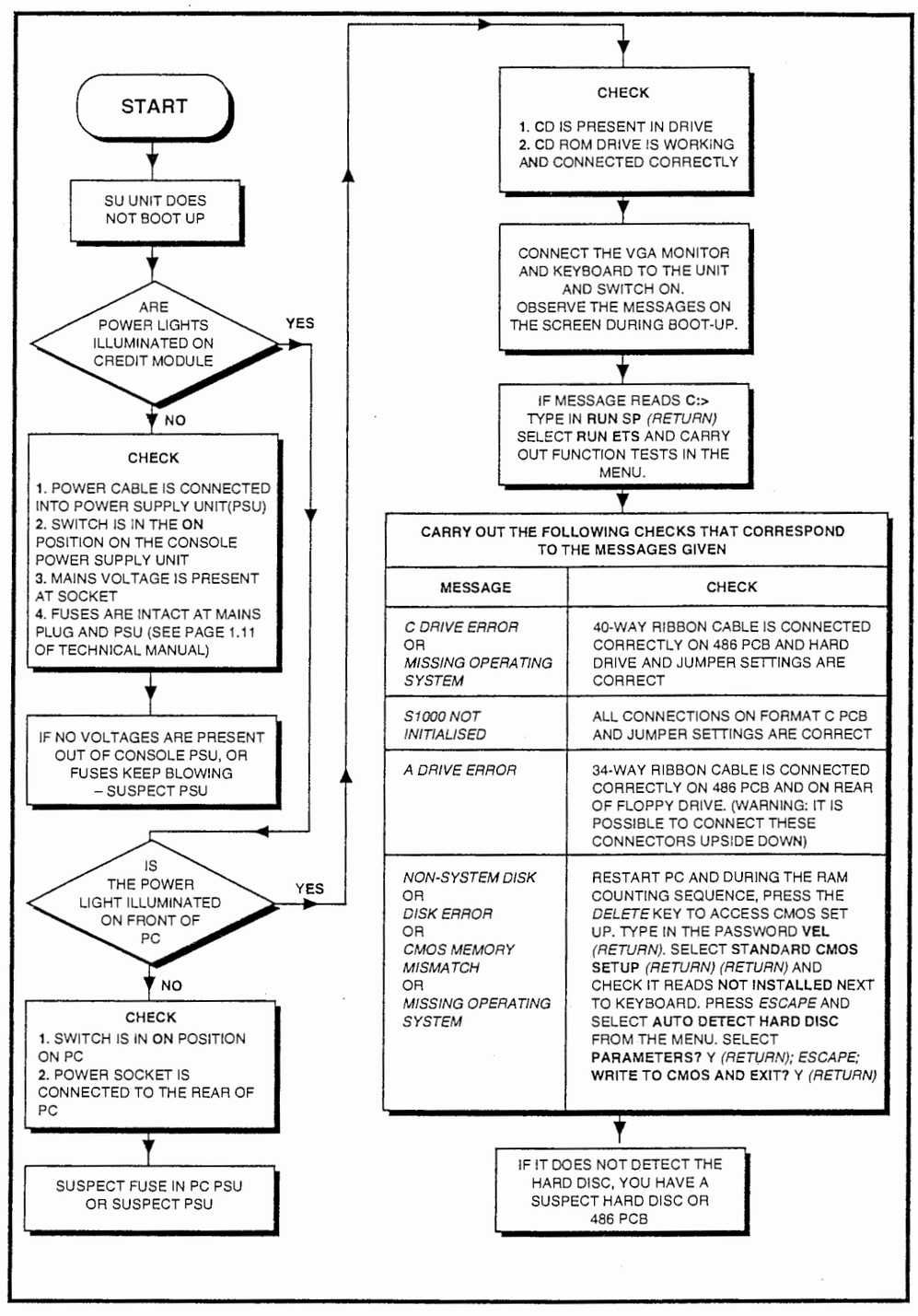


CONNECTS INTO FORMAT C OR MASTER DISTRIBUTION BOX

8-WAY MINI-DIN PLUG			
CABLE	PIN No	COLOUR	COMMENTS
	1,2	RED	MICNET IN (L&R)
	SHELL	SCREEN(R)	
	3	BLUE	MICNET OUT
	SHELL	SCREEN(B)	

CONNECTS INTO VOCALIZER OR MICNET DISTRIBUTION BOX

5-WAY DIN PLUG			
CABLE	PIN No	COLOUR	COMMENTS
	5	RED	OUT
	4	SCREEN(R)	
	3	BLUE	IN
	2	SCREEN(B)	


START
SU UNIT DOES NOT BOOT UP
ARE POWER LIGHTS ILLUMINATED ON CREDIT MODULE
YES
NO
CHECK
1. POWER CABLE IS CONNECTED INTO POWER SUPPLY UNIT(PSU)
2. SWITCH IS IN THE ON POSITION ON THE CONSOLE POWER SUPPLY UNIT
3. MAINS VOLTAGE IS PRESENT AT SOCKET
4. FUSES ARE INTACT AT MAINS PLUG AND PSU (SEE PAGE 1.11 OF TECHNICAL MANUAL)
IF NO VOLTAGES ARE PRESENT OUT OF CONSOLE PSU, OR FUSES KEEP BLOWING – SUSPECT PSU
IS THE POWER LIGHT ILLUMINATED ON FRONT OF PC
YES
NO
CHECK
1. SWITCH IS IN ON POSITION ON PC
2. POWER SOCKET IS CONNECTED TO THE REAR OF PC
SUSPECT FUSE IN PC PSU OR SUSPECT PSU
CHECK
1. CD IS PRESENT IN DRIVE
2. CD ROM DRIVE IS WORKING AND CONNECTED CORRECTLY
CONNECT THE VGA MONITOR AND KEYBOARD TO THE UNIT AND SWITCH ON. OBSERVE THE MESSAGES ON THE SCREEN DURING BOOT-UP.
IF MESSAGE READS C:> TYPE IN RUN SP (RETURN) SELECT RUN ETS AND CARRY OUT FUNCTION TESTS IN THE MENU.
CARRY OUT THE FOLLOWING CHECKS THAT CORRESPOND TO THE MESSAGES GIVEN
MESSAGE
CHECK
C DRIVE ERROR OR MISSING OPERATING SYSTEM
40-WAY RIBBON CABLE IS CONNECTED CORRECTLY ON 486 PCB AND HARD DRIVE AND JUMPER SETTINGS ARE CORRECT
S1000 NOT INITIALISED
ALL CONNECTIONS ON FORMAT C PCB AND JUMPER SETTINGS ARE CORRECT
A DRIVE ERROR
34-WAY RIBBON CABLE IS CONNECTED CORRECTLY ON 486 PCB AND ON REAR OF FLOPPY DRIVE. (WARNING: IT IS POSSIBLE TO CONNECT THESE CONNECTORS UPSIDE DOWN)
NON-SYSTEM DISK OR DISK ERROR OR CMOS MEMORY MISMATCH OR MISSING OPERATING SYSTEM
RESTART PC AND DURING THE RAM COUNTING SEQUENCE, PRESS THE DELETE KEY TO ACCESS CMOS SET UP. TYPE IN THE PASSWORD VEL (RETURN). SELECT STANDARD CMOS SETUP (RETURN) (RETURN) AND CHECK IT READS NOT INSTALLED NEXT TO KEYBOARD. PRESS ESCAPE AND SELECT AUTO DETECT HARD DISC FROM THE MENU. SELECT PARAMETERS? Y (RETURN); ESCAPE; WRITE TO CMOS AND EXIT? Y (RETURN)
IF IT DOES NOT DETECT THE HARD DISC, YOU HAVE A SUSPECT HARD DISC OR 486 PCB

SECTION 3

FORMAT D AND CREDIT MODULE

PAGE

3.1 Format D Exploded View

3.2 Format D Parts List

3.3 Format D Controls

3.4 Basic Description

3.6 Block Diagram

3.7 Format D Connections

3.8 Format D Pinouts

3.13 Fuse Locations and Voltage Test Points

3.14 Fuse Ratings

3.15 Maximiser Board

3.16 Maximiser Dipswitch Settings

3.17 Credit Module Exploded View

3.18 Credit Module Parts List

3.19 Magnetic Card Reader

3.20 V-Key Reader

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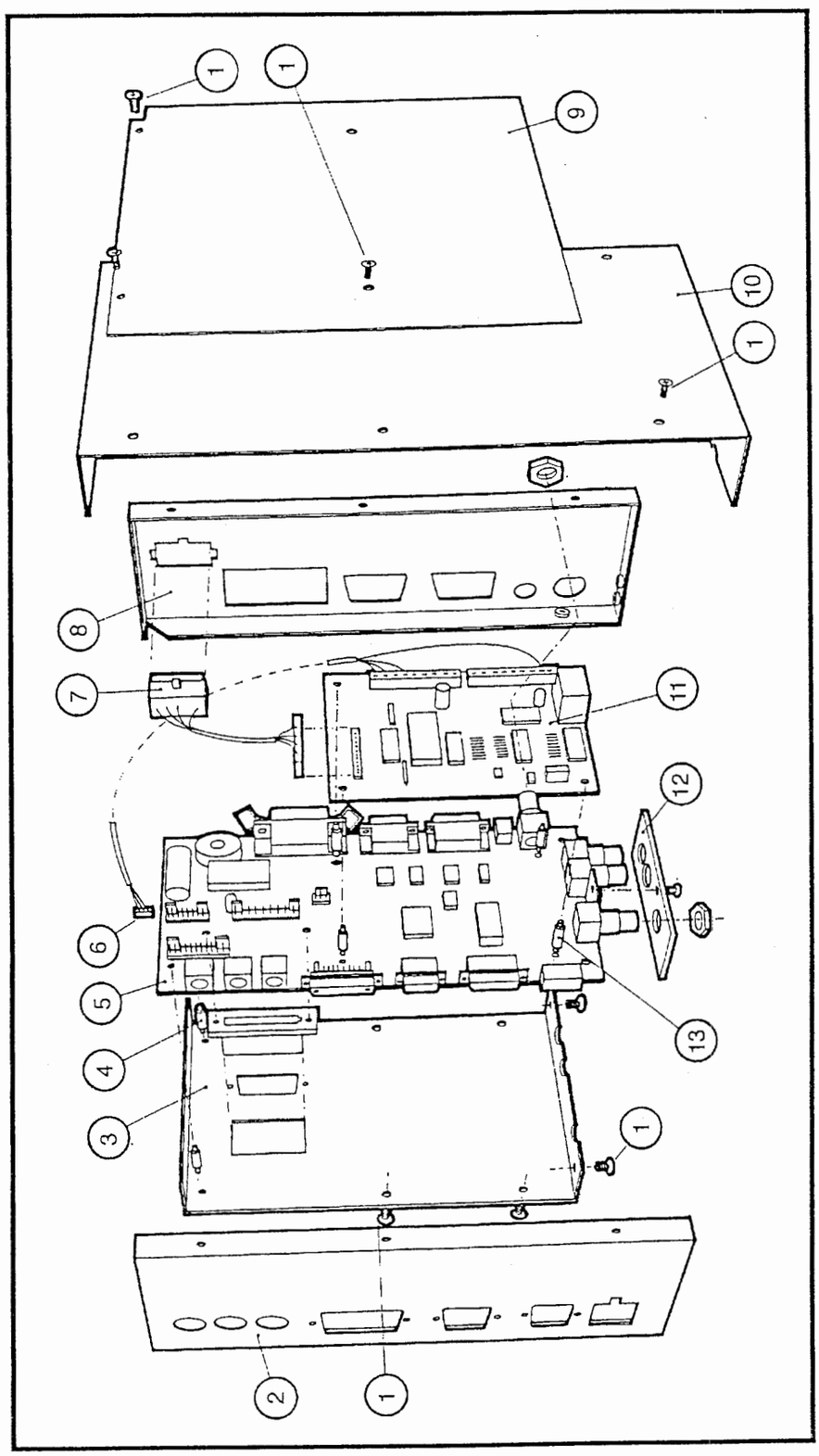

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ITEM	DESCRIPTION	QTY	PART NO
1	M4 x 6 POZI PAN	16	SCW 00133
2	FORMAT D L/H	1	238-092-03
3	FORMAT D BASE	1	238-090-05
4	SUPPORT POST	2	238-517
5	FORMAT D BOARD	1	238-508
6	MAXIMISER INT CABLE	1	238-100-01
7	INT CREDIT CABLE	1	238-067-01
8	FORMAT D R/H	1	238-093-03
9	SPEAKER BAFFLE	1	238-114-02
10	FORMAT D COVER	1	238-091-06
11	MAXIMISER BOARD	1	211-500
12	HEATSINK	1	238-094-03
13	SUPPORT POST	4	238-516

The following controls are located in the Credit Module and are accessed by removing the front control panel with the special key provided: (see Fig. 3.3.1)

VOLUME CONTROL — Sets the volume level for the external speaker
NOTE: The headphone volume level is software controlled

VISETTE® BRIGHTNESS LEFT AND RIGHT — Sets the brightness level in the left and right Visette® monitors

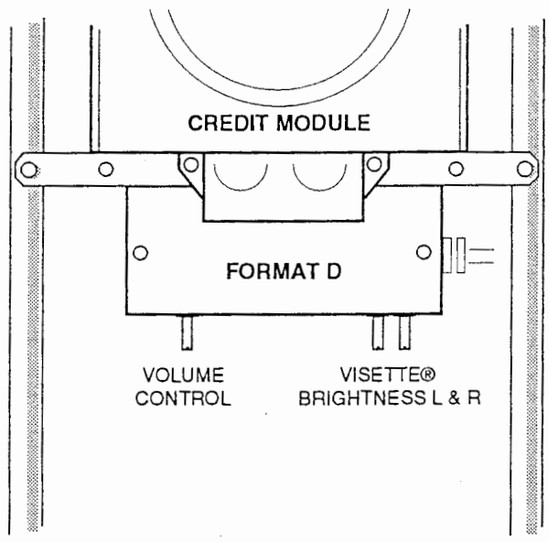


Fig. 3.3.1

FORMAT D

The distribution board is the main connection point for external connections - joysticks, lights, switches, speaker, coin mechanism, etc.

All cable connections from FORMAT D to other devices will have a maximum length of 5m.

Physical dimensions are 250 mm x 130 mm

The functions of this board are:-

1. Connects 17w2 Dee from FORMAT C to 26 way Gore SIC connector for Visette.

2. Provides 10W amplifier driving external 4R or 8R speaker, uses Line Audio from FORMAT C. Volume controlled by potentiometer and by a mute command from the FORMAT C or by a mute switch.

3. Accepts either two joysticks,or one joystick and a glove, using eight off eight bit ADCs. Joysticks can be replaced by switches to 0V to 5V, and a pair of resistors to give the centre position, Full scale positions will be 0-20 and 235-255

4. Accepts eight switch inputs from joysticks.

5. Provides a four way switch pack and four jumpers for option setting, diagnostics etc.

6. Uses +5V for all logic, +12V for the maximiser daughter board, +/- 12V for RS 232 drivers and generates +9V @ 0.6A for the Visette.

7. Provides 8 general purpose, TTl, O/C outputs for relay driving. Maximum voltage 30V, current 200mA.

8. Provides a buffered version of the left composite video output signal for use with a monitor, Video level is DC restored.

9. Connects to the serial link to the FORMAT C.

10. Passes the tracker source signal from the Polhemus board to the source coil. Passes the three tracker sensor signals from the Visette back to the Polhemus board.

11. Passes the glove/joystick tracker sensor signals back to the Polhemus board.

12. Provides potentiometer control of the two backlight brightness signals as they pass up to the Visette. The potentiometers provide a trimming mechanism to modify the signals from the FORMAT C.

13. Provides through connection of the Maximiser serial signals. Provides 12V at 370mA for this board.

14. Drives an external siren in the event of a break in the security link to the Visette or in the link to the Format C board. Siren rating is 85mA at 12V.

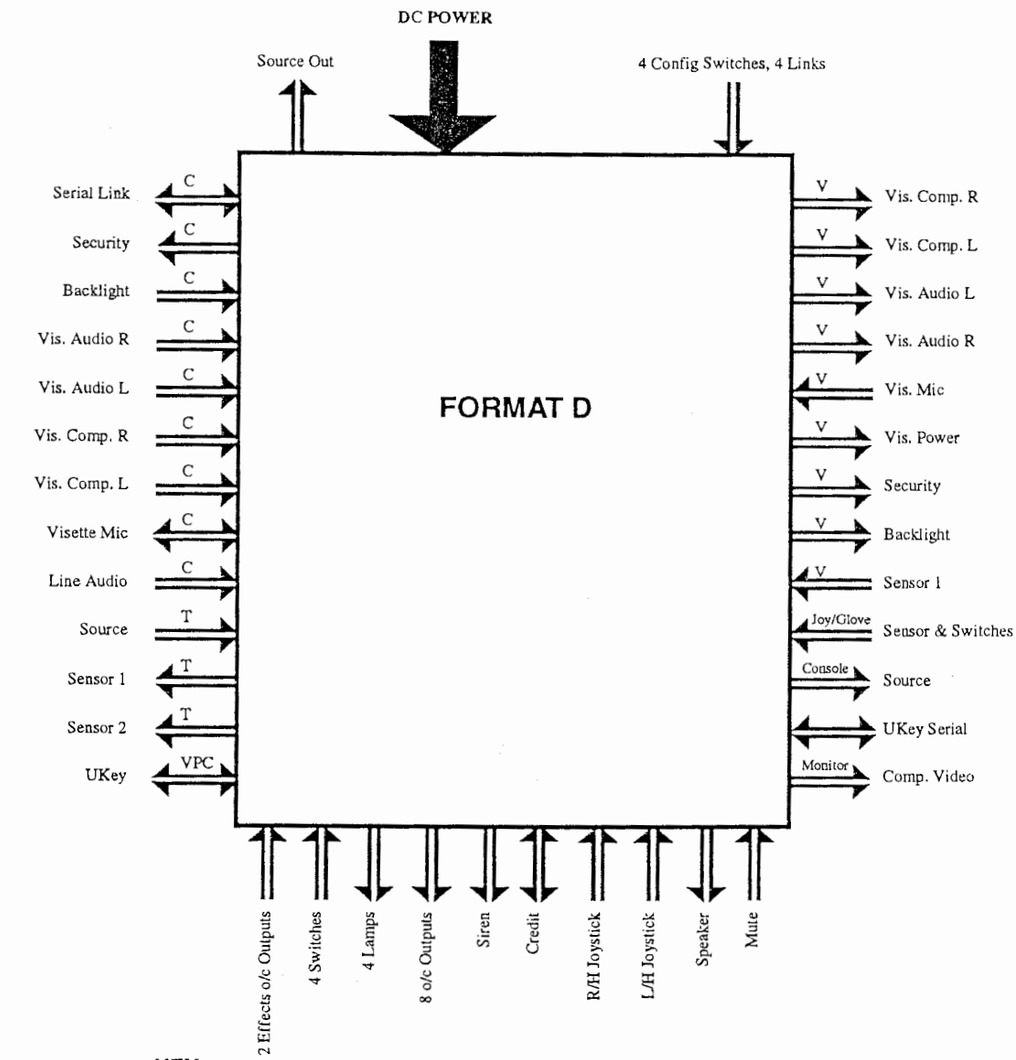
15. Provides test pins for +12V, +9V, +5V, 0V.

16. Drives four 12V console lamps.

17. Accepts four console switch inputs and four config jumpers.

18. Drives four effects lamps using off board SSRs or relays.

19. Drives the coin credit relay, 12V, lamp, using an open collector driver and also drives a TTL output signal. Reads the coin input signal, normally open contact.



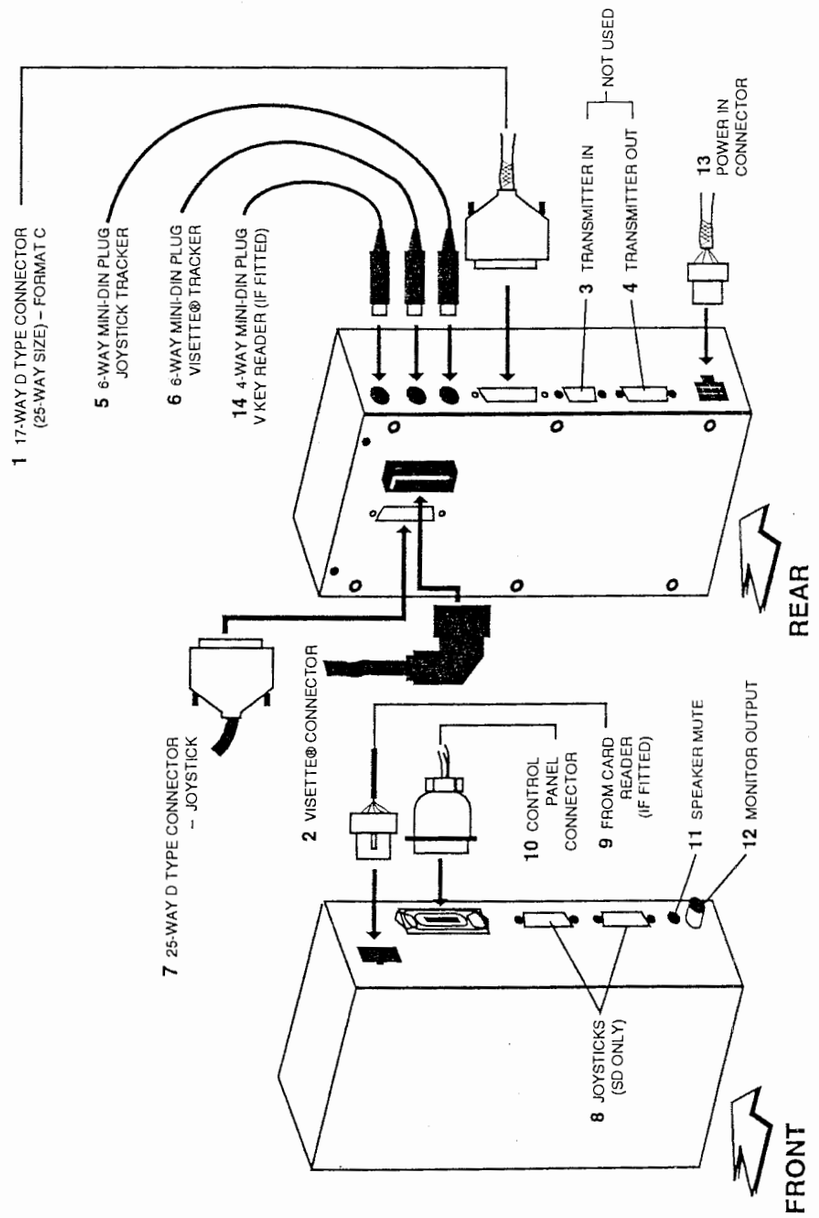
KEY:

C	**Format C**
T	**Tracker**
V	**Visette®**
VPC	**PC System**

The above diagram shows the multitude of inputs and outputs that are related to the Format D. The purpose of this is to provide a common connection point from the PC and video card to the rest of the system. It incorporates the following features:

- On board microcontroller – encodes and controls I/O devices and transfers these to the PC via a serial link.
- Provides a mono amplified 10 Watt speaker output.
- Provides a buffered composite video output to an external monitor.
- Powers the Visette®, passes through visual, tracker and audio signals.

If the Credit Module has been removed for transportation, the diagram below shows the positions of the various connections to the Format D computer which will have to be made.


1 17-WAY D TYPE CONNECTOR (25-WAY SIZE) – FORMAT C
5 6-WAY MINI-DIN PLUG JOYSTICK TRACKER
6 6-WAY MINI-DIN PLUG VISETTE® TRACKER
14 4-WAY MINI-DIN PLUG V KEY READER (IF FITTED)
NOT USED
3 TRANSMITTER IN
4 TRANSMITTER OUT
13 POWER IN CONNECTOR
REAR
7 25-WAY D TYPE CONNECTOR – JOYSTICK
2 VISETTE® CONNECTOR
10 CONTROL PANEL CONNECTOR
9 FROM CARD READER (IF FITTED)
11 SPEAKER MUTE
12 MONITOR OUTPUT
8 JOYSTICKS (SD ONLY)
FRONT

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SYSTEM 2000

1. – MALE 17W2 DEE CONNECTOR FOR CABLE TO FORMAT C.

CABLE TYPE		COLOUR	PIN No.	COMMENTS
	50Ω COAX		A1	VIDEO LEFT
	50Ω COAX		A2	VIDEO RIGHT
	6 X INDIVIDUALLY SCREENED SINGLES		8	AUDIO LEFT
		SCREEN	1	RETURN
			9	AUDIO RIGHT
		SCREEN	1	RETURN
			10	MICROPHONE
		SCREEN	2	RETURN
			15	LINE AUDIO
		SCREEN	7	RETURN
			13	TX
		SCREEN	6	RETURN
			14	RX
		SCREEN	6	RETURN
		OVERALL	3	SCREEN (GND)
			11	BACKLIGHT R
			12	BACKLIGHT L
			4	SECURITY

RG 174 COAX SOCKET INSERTS

2. – 26 WAY SIC CONNECTOR TO VISETTE®

(USE 26-WAY HEADER SUPPLIED TO MEASURE LOOM READINGS)

METER READING		COLOUR	PIN No.	COMMENTS
LEFT VISETTE	52Ω	CO-AX	1	VIDEO
		SCREEN	2	
	93Ω	BLACK	3	COIL 1
		WHITE	4	
	93Ω	RED	5	COIL 2
		BROWN	6	
	93Ω	BLUE	7	COIL 3
		YELLOW	8	
	40Ω	PURPLE	9	AUDIO
		SCREEN	10	
		GREY	11	+9V
		SCREEN	12	0V
			13	OUTER SCREEN
RIGHT VISETTE			14	OUTER SCREEN
	1.5KΩ	GREEN	15	+9V
		SCREEN	16	0V
	40Ω	PURPLE	17	AUDIO
		SCREEN	18	
	13.5KΩ	BLUE	19	LEFT BACKLIGHT
		YELLOW	20	RIGHT BACKLIGHT
		RED	21	MIC
		BROWN	22	SECURITY
	1.5KΩ	BLACK	23	0V
		WHITE	24	+9V
	52Ω	CO-AX	25	VIDEO
		SCREEN	26	

2	1
4	3
6	5
8	7
10	9
12	11
14	13
16	15
18	17
20	19
22	21
24	23
26	25

WARNING:
WHEN OPENING THIS CONNECTOR, MAKE SURE THE 26-WAY HEADER IS IN PLACE BEFORE YOU SEPARATE THE SHELL

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3. – SOURCE IN, 9 WAY MALE DEE, CONNECTS THROUGH TO ....

CABLE TYPE	COLOUR	PIN No.	COMMENTS.
PAIR 1	BLACK	1	COIL 1 START
	WHITE	6	COIL 1 FINISH
PAIR 2	RED	2	COIL 2 START
	BROWN	7	COIL 2 FINISH
PAIR 3	BLUE	3	COIL 3 START
	YELLOW	8	COIL 3 FINISH
	SCREEN	5	COIL SCREEN
	SHELL		SYSTEM SCREEN

NOT USED

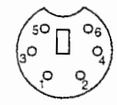
4. – SOURCE OUT, 15 WAY MALE DEE, PIN OUT AS FOLLOWS:

CABLE TYPE	COLOUR	PIN No.	COMMENTS.
PAIR 1	BLACK	2	COIL 1 START
	WHITE	10	COIL 1 FINISH
PAIR 2	RED	3	COIL 2 START
	BROWN	11	COIL 2 FINISH
PAIR 3	BLUE	4	COIL 3 START
	YELLOW	12	COIL 3 FINISH
	SCREEN	BODY	COIL SCREEN

NOT USED

5, 6. – TWO OFF SENSOR OUT, 6 PIN MINI DIN, CONNECTS TO POLHEMUS BOARD

METER READING	COLOUR	PIN No.	COMMENTS.
93Ω	BLACK	1	COIL 1 START
	WHITE	2	COIL 1 FINISH
93Ω	RED	3	COIL 2 START
	BROWN	5	COIL 2 FINISH
93Ω	BLUE	4	COIL 3 START
	YELLOW	6	COIL 3 FINISH
	SCREEN	SHELL	COIL SCREEN



6-WAY
MINI-DIN
PLUG
(FRONT VIEW)

7 – GLOVE/JOYSTICK CONNECTOR (WITH TRACKER SENSOR, 25 WAY FEMALE DEE).

METER READING	COLOUR	PIN No.	COMMENTS.
93Ω	BLACK	1	COIL 1 START
	WHITE	14	COIL 1 FINISH
93Ω	RED	2	COIL 2 START
	BROWN	15	COIL 2 FINISH
93Ω	BLUE	3	COIL 3 START
	YELLOW	16	COIL 3 FINISH
	SCREEN	4	COIL SCREEN
	SCREEN	17	SWITCH SCREEN
	ORANGE	5	SWITCH 1
		18	SW 1.2 RTN
	GREEN	6	SWITCH 2
		7	SW 3.4 RTN
		19	SWITCH 3
		20	SWITCH 4
		9	INPUT 6
		22	INPUT 5
		10	INPUT 4
		23	INPUT 3
		11	INPUT 2
		24	INPUT 1
		13	GLOVE SCREEN
		12	GLOVE +9V
		25	GLOVE 0V
	PINK	8	SECURITY
	GREY	21	SECURITY 0V

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8. – 2 AXIS JOYSTICK, 15W FEMALE DEE, TWO OFF, LEFT AND RIGHT JOYSTICKS.

CABLE TYPE	COLOUR	PIN No.	COMMENTS.
12 CORE BRAIDED SCREEN SHEATHED BLACK	BLUE	1	X AXIS +VE
	GREEN	2	
	RED	3	X AXIS -VE
	YELLOW	4	X AXIS WIPER
	BROWN	5	Y AXIS +VE
	PURPLE	6	
	BLACK	7	Y AXIS -VE
	WHITE	8	Y AXIS WIPER
	TURQUOISE	9	SW 1 (TRIGGER)
	GREY/ORANGE	10	SW 1 & 2 RTN
	PINK	11	SW 2 (TOP)
		12	SW 3
		13	SW 3 & 4 RTN
		14	SW 4
		15	
	SCREEN		SHELL

9. – CREDIT CONNECTOR, 10 WAY 0.1" MOLEX.

CABLE TYPE	COLOUR	PIN No.	COMMENTS.
12 CORE BRAIDED SCREEN SHEATHED BLACK	RED	1	+ 12V
		2	+ 12V
		3	RX
		4	TX
		5	HANDSHAKE
	GREEN	6	CONTACT I/P – 0V
		7	0V
	BLUE	8	O/C O/P
		9	TTL O/P
	YELLOW	10	0V

SYSTEM 2000

10. - CONTROL PANEL CONNECTOR

FORMAT D END				
CABLE TYPE		COLOUR	PIN No.	COMMENTS
CABLE A	8 CORE 7/0.2 FOIL SCREEN BLACK SHEATH	BROWN	12	SWITCH 1
		RED	24	
		WHITE	11	LAMP 1.
		YELLOW	23	
		GREEN	10	SWITCH 2
		BLUE	22	
		PURPLE	9	LAMP 2
		BLACK	21	
		SCREEN	SHELL	
CABLE B	8 CORE 7/0.2 FOIL SCREEN BLACK SHEATH	BROWN	8	SWITCH 3
		RED	20	
		WHITE	7	LAMP 3
		YELLOW	19	
		GREEN	6	SWITCH 4
		BLUE	18	
		PURPLE	5	LAMP 4
		BLACK	17	
		SCREEN	SHELL	
CABLE C	4 CORE 7/0.2 FOIL SCREEN	SCREEN	SHELL	
		RED	15	SIREN +
		BLUE	3	SIREN -
		YELLOW	2	SPEAKER +
		GREEN	14	SPEAKER -
			1	LED +
			13	LED -
			16	SCREEN
			4	SCREEN

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11. – SPEAKER MUTE SWITCH, 3.5 mm JACK, MAKE TO MUTE.

12. – BUFFER MONITOR VIDEO OUTPUT, BNC, 75R, LEFT VIDEO

13. – 12V DC INPUT, MOLEX MINI FIT JR, 8 WAY, 90 DEGREE.

CABLE TYPE		COLOUR	PIN No.	COMMENTS.
		RED	1	+ 5V
		YELLOW	2	+ 12V
		YELLOW	3	+ 12V
		WHITE	4	- 12V
		BLACK	5	0V
		BLACK	6	0V
		BLACK	7	0V
			8	F GND

14. – U KEY SERIAL OUTPUT CONNECTOR, 4W MINIDIN

U KEY				
CABLE TYPE		COLOUR	PIN No.	COMMENTS.
4 CORE 7/0.1		GREEN	1	SIGNAL GND
		BLUE	2	TX
		RED	3	RX
		YELLOW	4	HANDSHAKE
		SCREEN	SHELL	

4 WAY MINI DIN PLUG (front view)

SLAVE, COMBINED SENSOR CABLE – SITUATED IN MASTER DISTRIBUTION BOX

COMBINED SENSOR CONNECTOR				
METER READING	PIN No.	COLOUR	COLOUR	
93Ω	1	BLACK	COIL 1 (X)	VISETTE® SENSOR
	14	WHITE		
93Ω	2	RED	COIL 2 (Y)	
	15	BROWN		
93Ω	3	BLUE	COIL 3 (Z)	
	16	YELLOW		
	4	SCREEN		
93Ω	5	BLACK	COIL 1 (X)	J/STICK SENSOR
	18	WHITE		
93Ω	6	RED	COIL 2 (Y)	
	19	BROWN		
93Ω	7	BLUE	COIL 3 (Z)	
	20	YELLOW		
	17	SCREEN		
	11	SCREEN		V-KEY
	12	BLUE	TX	
	24	RED	RX	
	13	YELLOW	HANDSHAKE	
	25	GREEN	SIGNAL GND	

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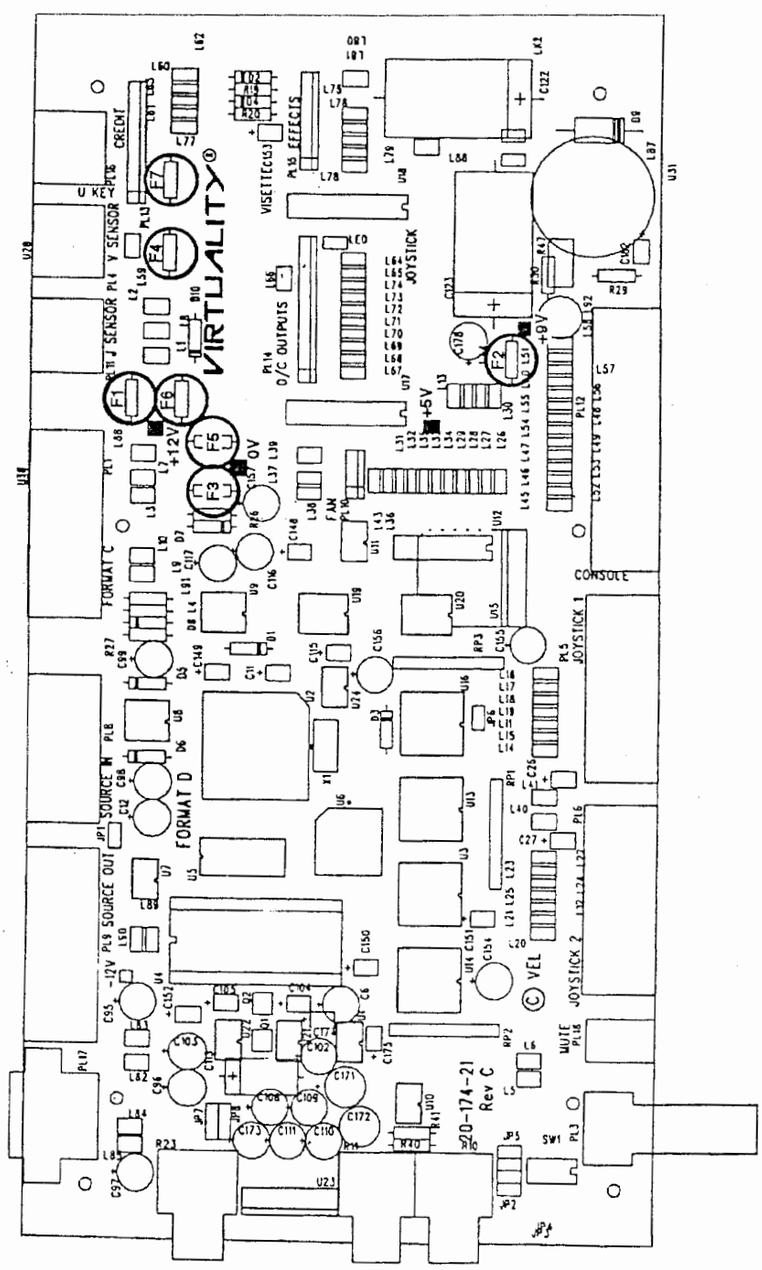


+0V TEST POINT
+5V TEST POINT
+9V TEST POINT
+12V TEST POINT

FUSE	PROTECTING	RATING	PART No.
F1	+9V TO VISETTE® LEFT AND RIGHT L.C.D.s	1 AMP	FUS 00008
F2	+9V TO SPACEGLOVE	500mA	FUS 00007
F3	+12V TO FAN AND POWER ON NOT USED	1AMP	FUS 00008
F4	+12V TO MAXIMISER CREDIT BOARD	1AMP	FUS 00008
F5	+12V TO LAMPS AND SIREN	2AMP	FUS 00009
F6	+12V OPEN COLLECTOR OUTPUTS NOT USED	1AMP	FUS 00008
F7	+12V EFFECTS LIGHTING NOT USED	500mA	FUS 00007

SYSTEM 2000

Fitted inside the Format D module is a Maximiser Board.

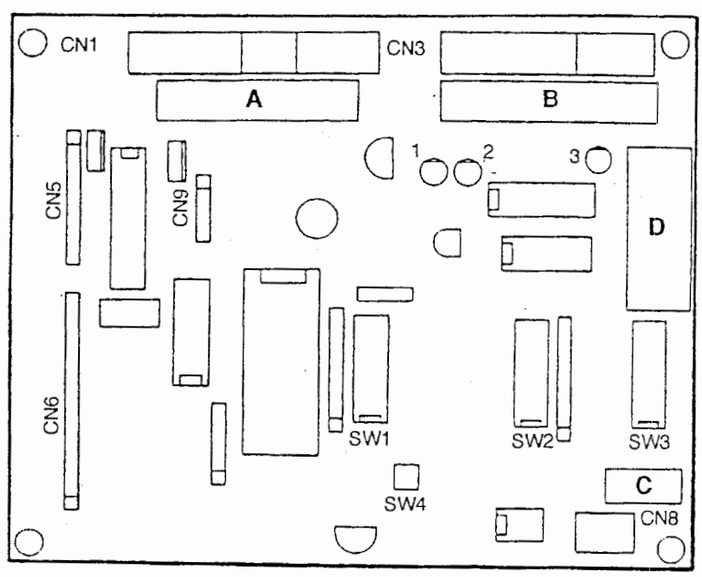
Maximiser is a highly versatile electronic module to control credits and to fix pricing on coin operated equipment.

P.C.B. size:

Overall Dimensions	128mm x 102mm x 30mm
Fixing centres	117mm x 94mm

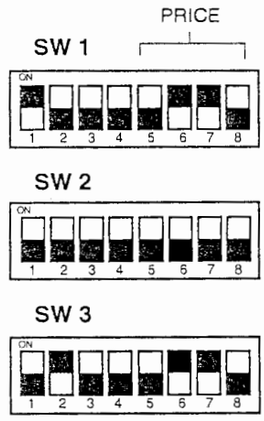
Electrical:

Supply Voltage	12v

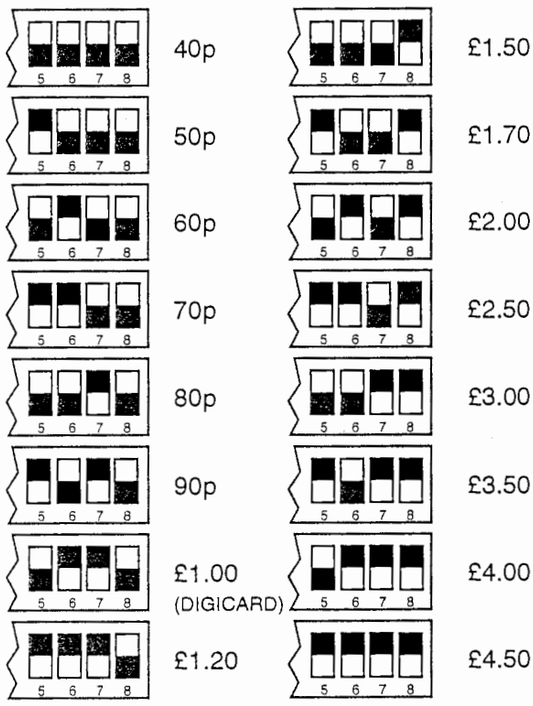


CN1 = Power and input connector
CN3 = Output connector
CN5 = Maxi display connector
CN6 = Coin acceptor connector
SW3 = Option switches
SW4 = Service test switch
SW1 = Price and mode switch

MAXIMISER SWITCH SETTINGS



SW 1



= SWITCH IN **UP** POSITION

AMENDMENT No. 1

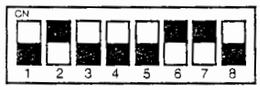
MAXIMISER SWITCH SETTINGS (BONUS)

SW 1

BONUS

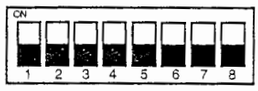
SW 2

SW 3



SW 2

NO BONUSES



1 CREDIT = 1 PLAY, 2 CREDITS = 2 PLAYS
3 CREDITS = 3 PLAYS, 4 CREDITS = 4 PLAYS
ETC.

SINGLE BONUS

1 CREDIT = 1 PLAY, 2 CREDITS = 3 PLAYS
3 CREDITS = 4 PLAYS, 4 CREDITS = 5 PLAYS
ETC.

DOUBLE BONUS

1 CREDIT = 1 PLAY, 2 CREDITS = 4 PLAYS
3 CREDITS = 5 PLAYS, 4 CREDITS = 6 PLAYS
ETC.

TREBLE BONUS

1 CREDIT = 1 PLAY, 2 CREDITS = 5 PLAYS
3 CREDITS = 6 PLAYS, 4 CREDITS = 7 PLAYS
ETC.

= SWITCH IN **ON** POSITION (UP)

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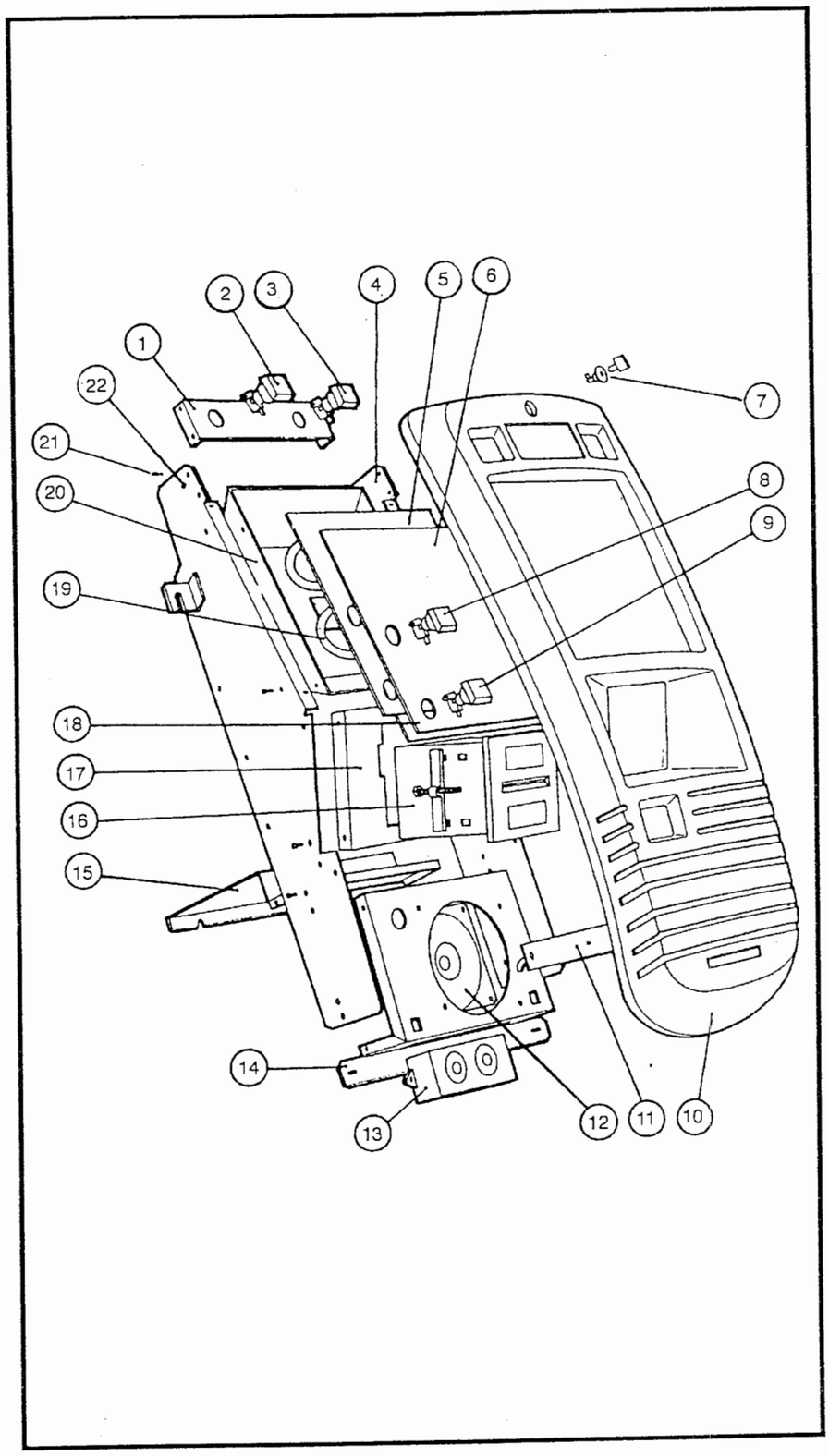
SYSTEM 2000



No.	DESCRIPTION	QTY	PART No.
1	CROSS BAR	1	238-101-04 *
2	START BUTTON - GREEN	1	238-518G
3	LINK-UP BUTTON - YELLOW	1	238-518Y
4	R/H SIDE PANEL	1	238-101-04 *
5	EXPERIENCE GEL	2	
6	GEL COVER	1	238-016-03
7	LOCK	1	238-501
8	BLUE INDICATOR	1	238-518B
9	ORANGE INDICATOR	1	238-518O
10	BEZEL	1	238-012-02
11	LOWER BRACKET	1	238-056-02
12	LOUDSPEAKER	1	238-500
13	ALARM SIREN	1	238-503
14	SPEAKER MOUNT	1	238-101-04 *
15	CENTRE BRACKET	1	238-101-04 *
16	CARD READER	1	211-523
17	CARD READER PLATE	1	238-101-04 *
18	DIFFUSER	1	238-014-02
19	LAMP 2D	1	238-502
20	LIGHT BOX	1	238-102-02
21	M4 X 12 SCREW	22	SCW 00132
22	L/H SIDE PANEL	1	238-101-04 *

* Credit Module Assembly (metalwork)

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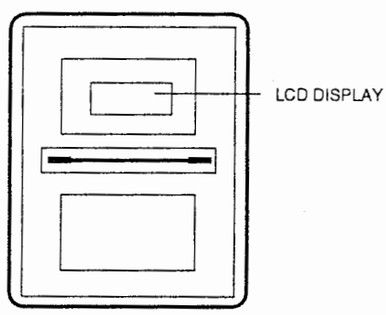
The GPRD (General Purpose Reader with LCD) is a magnetic credit card reader system to enable a cashless credit system on the System 2000.

The GPRD consists of a logic board, associated LCD board and power board running at +12v DC.

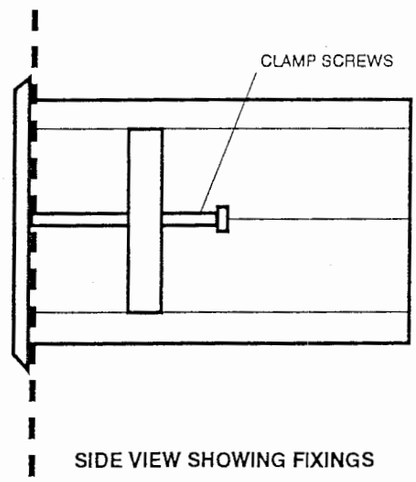
The GPRD unit uses the GPR 44 bit code system and takes vends off a validated card with correct Header, Major Customer, Site Identification and Value check. The unit is normally without any punch marks. As it takes off vends, a punch mark will appear to show remaining credits. The cards can be 1,3,5,10 or 20 credits each.

Troubleshooting

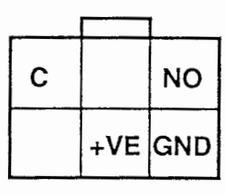
If a card gets stuck inside the reader or does not give credits, the reading heads may need to be cleaned using a cleaning kit. Frequency of cleaning is dependent upon the number of cards inserted per day and the environment in which the reader has to operate. Dirty heads are more difficult to clean, so little and often is the best policy.



FRONT PANEL



SIDE VIEW SHOWING FIXINGS



REAR CONNECTOR

C = RELAY COMMON
NO = RELAY (NORMALLY OPEN)
+VE = +12V D.C.
GND = GROUND ZERO VOLT

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The V-Key system is a system for cashless payment, information and security and makes available a solution to problems in a company organisation by utilising an electronic data reading device.

V-Key is made of high quality plastic and is equipped with a chip for storing the data. The chip, an EPROM, may be read as well as written to. Data is preserved for at least ten years without requiring power back-up. The most various data such as amounts of money, access and identification codes, statistics data, parameters etc. can be stored on the V-Key.

Reading and writing data is done by means of a read/write unit which establishes the connections to the corresponding devices such as vending machines, cash registers, access control - and time registration systems, computers etc.

The V-Key system is a genuine alternative to the large choice of credit card systems. V-Key mainly offers the following advantages:

- Rugged design
- Large number of read/write cycles and therefore long-time stability (5 years plus at 15 insertions per day!)
- Small dimensions
- Insensitive to magnetic and inductive influences
- Minimum impairment by dirt and humidity.

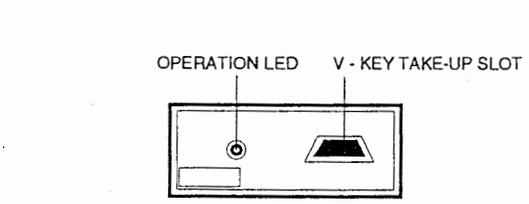
Advantages of the V-Key system

- The application of V-Key is an operation the user is familiar with. Preferably the V-Key is carried on the personal key ring together with the conventional keys.
- A long service life is reached even with multiple applications.
- Versatility – can be used on a fairly basic level to credit the system, or used in conjunction with the EXPOS® Point of Sale system, it can store information about the player's identity, current game position etc.

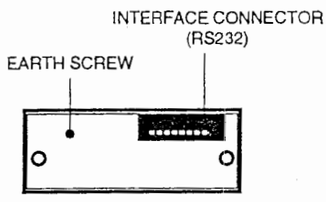
The unit with the designation URN is for the reading only of data from the V-Key. This unit is a compact device designed in up-to-date CMOS technology.

The unit essentially consists of the following modules:

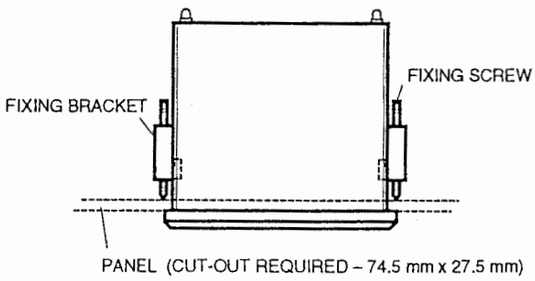
- A micro processor which controls all the proceedings of the unit and ensures a high degree of flexibility.
- A watch dog that checks the micro processor for proper functioning.
- An EPROM for storing the unit's parameters.
- A take-up slot with a locking mechanism for the V-Key.
- A two-colour LED (red/green) for displaying the operating state.
- An interface for connecting the card-reader adaptor.



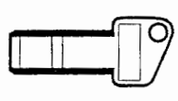
FRONT PANEL



REAR PANEL



PLAN SHOWING FIXINGS



V-KEY

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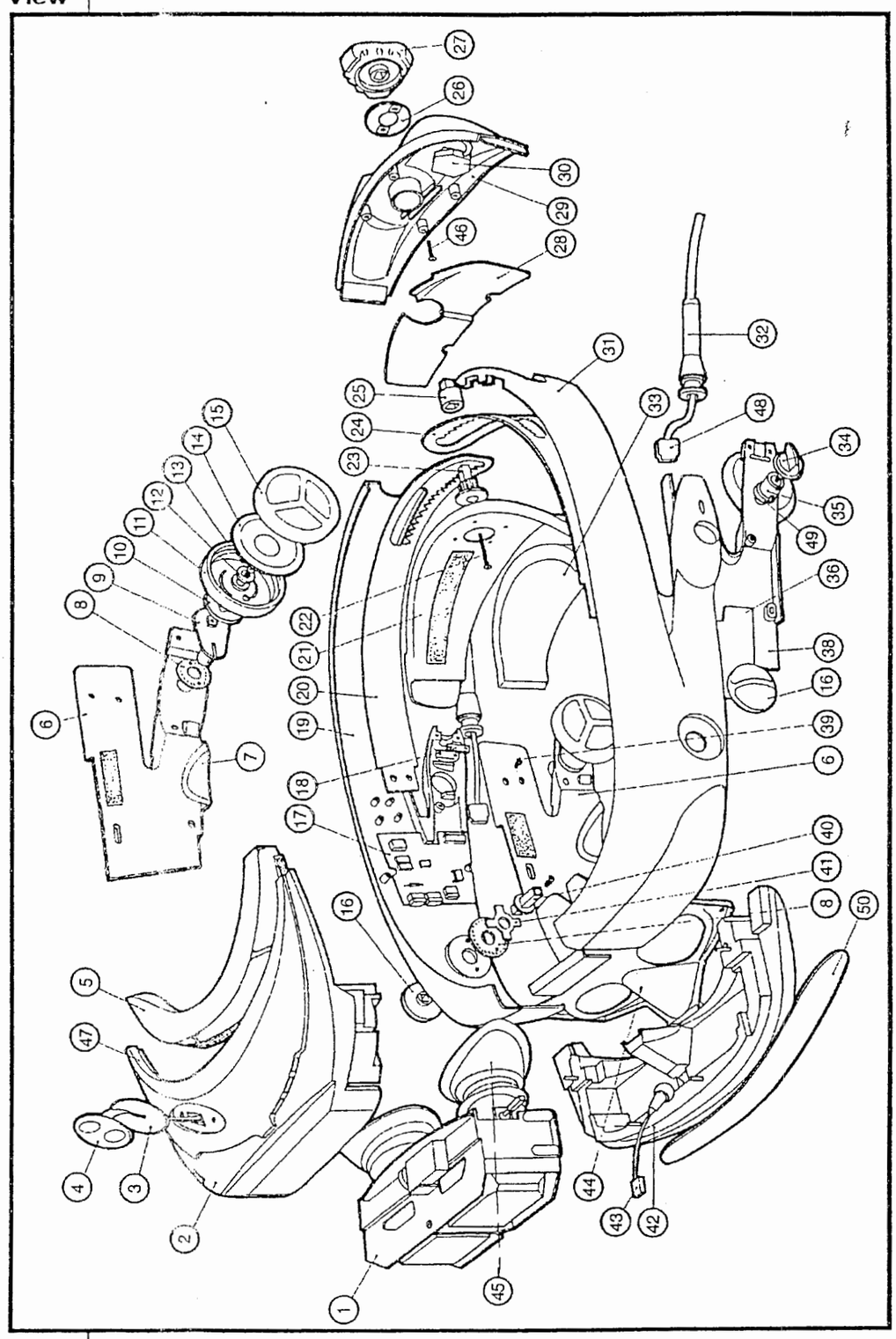
SPECIFICATIONS

Type:	UR1
Dimensions:	86mm x 35 mm x 75mm O/A
Installation:	In front panel, fastened from the back
Installing attitude:	Any
Weight:	240 grams
Temperature range:	-20°C to +50°C
Humidity:	Max. 90% non condensing
Acceleration:	Max. 6g
Insertion Cycles:	> 500,000
Power supply:	5V DC, 12V DC depending on type of adaptor
Current consumption:	80mA idle; 200mA activated
Interface:	RS232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PAGE

4.1 Visette® 2000 Exploded View
4.2 Visette® 2000 Parts List
4.4 Optics Box Assembly Exploded View
4.5 Optics Box Assembly Parts List
4.6 Visette® Format Specifications
4.7 Technical Data
4.8 Left Hand Board – Connectors and Pinouts
4.9 Right hand Board – Connectors and Pinouts
4.10 Visette® Fault Finding Guide

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SYSTEM 2000

ITEM	DESCRIPTION	QTY	PART No
1	DISPLAY BOX ASSY	1	OA OPTICS ASSY
2	TOP HOUSING	1	230-012-02
3	SWITCH PLATE	1	230-060-01
4	MEMBRANE SWITCH	1	230-048-01
5	FOREHEAD PAD	1	230-049-02
6	CONNEX PCB COVER R/H	1	230-022-01
7	THUMB GRIP R/H	1	230-074-01
8	RATCHET B	4	230-044-01
9	HEADPHONE ARM	2	230-028-01
10	HEADPHONE FOAM GASKET	2	230-062-01
11	HEADPHONE CASE	2	230-026-01
12	HEADPHONE ARM CAP	2	230-030-01
13	SCREW	14	SCW00137
14	HEADPHONE MODULE	2	230-501
15	HEADPHONE COVER	2	230-027-01
16	FOCUS KNOB	2	230-040-02
17	CONNEX PCB R/H	1	230-053-01
18	CABLE CLAMP	2	230-063-02
19	BODY SHELL R/H	1	230-010-03
20	INNER ADJUST STRAP	1	230-018-01
21	HEADBAND INNER	1	230-014-03
22	SCREW	1	SCW00136
23	ADJUST GEAR	1	230-019-01
24	OUTER ADJUST STRAP	1	230-017-01
25	ADJUST KNOB SPIGOT	1	230-065-01
26	ADJUST DETENT	1	230-020-01
27	ADJUST KNOB	1	230-021-03
28	INTERNAL SENSOR COVER	1	230-016-01
29	HEADBAND OUTER	1	230-015-03
30	INSIDETRAK RECEIVER	1	239-502R
31	BODY SHELL L/H	1	230-011-03
32	CABLE STRAIN RELIEF	2	230-064-03
33	HEADBAND PAD	1	230-050-02
34	HEADPHONE KNOB	2	230-031-02
35	HEADPHONE SLEEVE	2	230-029-01
36	CONNEX PCB L/H	1	230-054-01
37	THUMB GRIP L/H (NOT SHOWN)	1	230-087-01

SYSTEM 2000

ITEM	DESCRIPTION	QTY	PART No
38	CONNEX PCB COVER L/H	1	230-023-01
39	SCREW	18	SCW 00063
40	CAM DRIVER	2	230-042-01
41	FOCUS CROSS RATCHET 'A'	2	230-043-01
42	BOTTOM HOUSING	1	230-013-02
43	MICROPHONE CABLE ASSY	1	230-078-01
44	FACEMASK	1	230-024-02
45	RUBBER EYE CUP	2	230-025-01
46	SCREW	4	SCW00065
47	VELCRO	220mm	210-503L
48	12-WAY HARWIN CONNECTOR	2	
49	CABLE COLLAR	2	230-089-01
50	VIRTUALITY PAD	1	230-051-01

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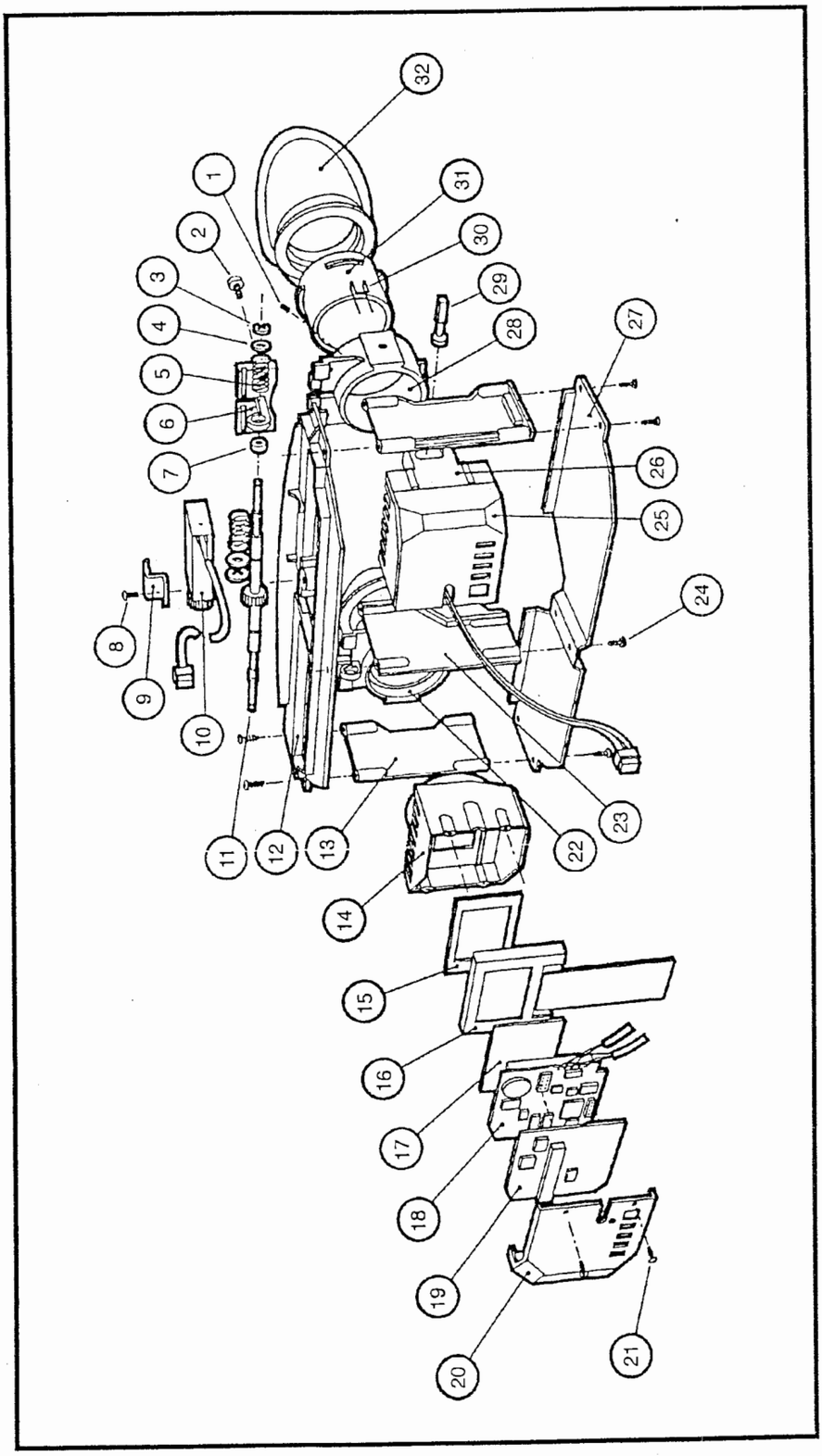
SYSTEM 2000



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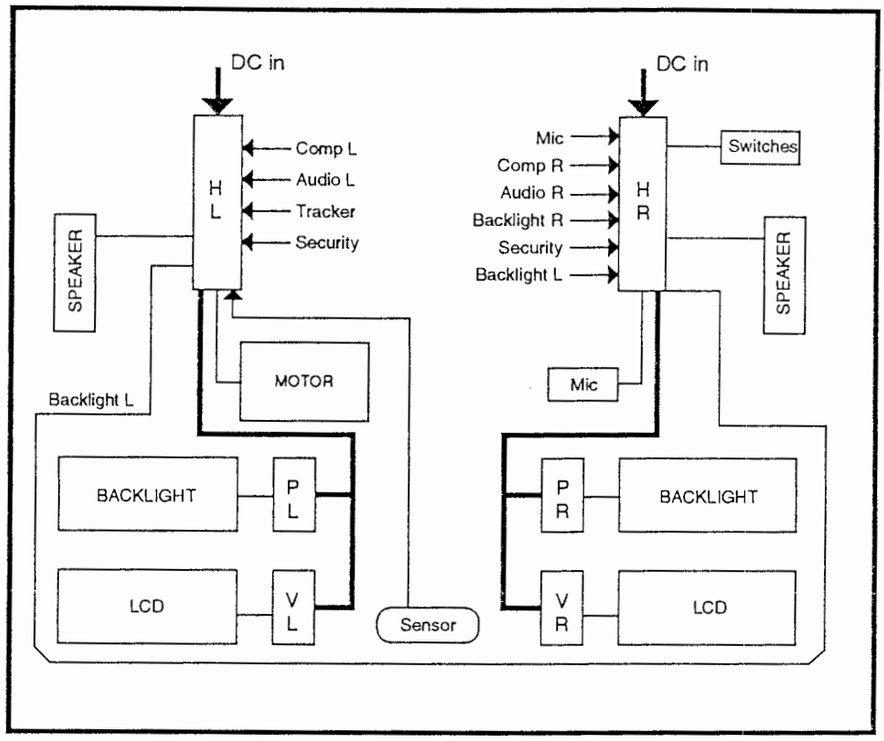
ITEM	DESCRIPTION	QTY	PART No
1.	M2 x 3 GRUB SCREW	4	SCW 00142
2.	M2.5 X 4.5 POZI PAN SCREW	4	SCW 00140
3.	CIRCLIP	4	
4.	NYLON M3 WASHER	4	
5.	SPRING	4	230-506
6.	LENS CELL SUPPORT L/H R/H	2	230-080-01
7.	LEAD SCREW NUT L/H R/H	2	
8.	SCREW	1	SCW 00063
9.	MOTOR CLAMP	1	230-073-01
10.	MOTOR AND GEAR	1	230-503
11.	LEAD SCREW	1	230-045-01
12.	DISPLAY TOP	1	230-082-01
13.	DISPLAY SIDE	2	230-084-01
14.	DISPLAY CARRIER R/H	1	230-034-02
15.	LCD MASK	2	230-086-01
16.	LCD	2	230-510
17.	POLARIZER	2	
18.	R/H LCD POWER PCB	1	230-088-01
19.	R/H LCD VIDEO PCB	1	230-068-01
20.	DISPLAY COVER R/H	1	230-036-02
21.	SCREW 17 X 6 PAN HEAD	8	SCW 0141
22.	LENS HOUSING R/H	1	230-032-01
23.	DISPLAY CENTRE	1	230-085-01
24.	SCREW		SCW 00063
25.	DISPLAY COVER L/H	1	230-037-02
26.	DISPLAY CARRIER L/H	1	230-035-01
27.	DISPLAY BASE	1	230-083-01
28.	LENS HOUSING L/H	1	230-033-01
29.	FOCUS CAM	2	230-041-01
30.	FOCUS CAM RETAINER	2	230-067-01
31.	LENS SET ASSY	2	230-517
32.	EYE CUP	2	230-025-01



Format VL and VR

- This processes the composite signal into a form that can be displayed by the LCDs

Format PL and PR

- Provides power for the backlights and the Format VL and VR

Format HL

- Motor control circuitry on this board controls the interoccular adjustment
- Main left hand loom connects to this point to be distributed to other parts

Format HR

- Microphone pre-amplification
- Main right hand loom signals are processed or distributed

VIRTUALITY®

Headphones

SYSTEM 2000

Field of View:	60°(v) x 47°(h) each eye
Display Format:	244 x 756
Overlap:	100%
Display:	Active matrix colour LCD
Pixel Size (arc min.):	47.6
Pixel Structure:	Delta
Weight:	650gms
Transducer Type:	Dynamic
Operating Principle:	Open
Frequency Response:	30Hz – 18Khz
Nominal Impedance:	40 ohms
Total Harmonic Distortion:	<0.4%

F1 – 1 AMP FUSE FUS 00012
Protecting +9V to LCD

PL1 – 2 WAY FOR MOTOR

PIN	COLOUR	SIGNAL
1	GREY	MOTOR -
2	GREY	MOTOR +

PL3 – 12 WAY L/H LOOM

PIN	COLOUR	SIGNAL
1	CO-AX	VIDEO
7	CO-AX SHIELD	SHIELD
2	BLACK	COIL 1
8	WHITE	
3	RED	COIL 2
9	BROWN	
4	BLUE	COIL 3
10	YELLOW	
5	PURPLE	AUDIO
11	SCREEN	
6	GREY/GREEN	+9V
12	SCREEN	0V

PL4 – 10 WAY SENSOR

PIN	COLOUR	SIGNAL
1		GROUND
6		SCREEN
2	BLACK	COIL 1
7	WHITE	
3	RED	COIL 2
8	BROWN	
4	BLUE	COIL 3
9	YELLOW	

PL5 – 6 WAY LCD

PIN	COLOUR	SIGNAL
1	RED	+9V
4	BLACK	0V
2	BROWN	BACKLIGHT
3	CO-AX	VIDEO
6	SCREEN	VID GND

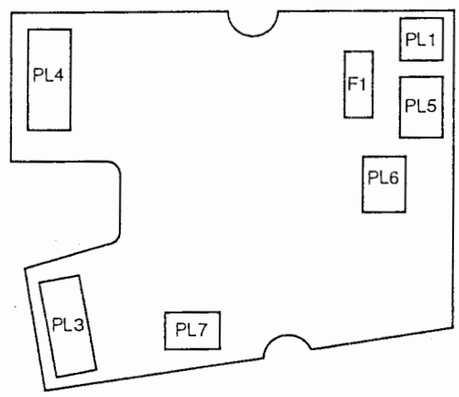
PL6 – 4 WAY BACKLIGHT

PIN	COLOUR	SIGNAL
1	GREY	SW 1
2	GREY	SW 2
3	GREY	BACKLIGHT
4	GREY	GND

PL7– 2 WAY HEADPHONE

PIN	COLOUR	SIGNAL
1	GREY	AUDIO
2	GREY	SCREEN

H.L. BOARD 230-054-01



F2 – 1 AMP FUSE FUS 00012
Protecting +9V to LCD

PL8 – 12 WAY RH LOOM

PIN	COLOUR	SIGNAL
1	CO-AX	VIDEO
7	CO-AX SHIELD	SCREEN
2	BLACK	0V
8	WHITE	+9V
3	RED	MIC
9	BROWN	SECURITY
4	BLUE	BACKLIGHT L
10	YELLOW	BACKLIGHT R
5	PURPLE	AUDIO
11	SCREEN	AUDIO
6	GREY/GREEN	+9V
12	SCREEN	0V

PL9 – 6 WAY LCD

PIN	COLOUR	SIGNAL
1	RED	+9V
4	BLACK	0V
2	BROWN	BACKLIGHT
3	CO-AX	VIDEO
6	SCREEN	VID GND

PL10 – 4 WAY BACKLIGHT

PIN	COLOUR	SIGNAL
1	GREY	SW 1
2	GREY	SW 2
3	GREY	BACKLIGHT
4	GREY	GND

PL11– 2 WAY HEADPHONE

PIN	COLOUR	SIGNAL
1	GREY	AUDIO
2	GREY	SCREEN

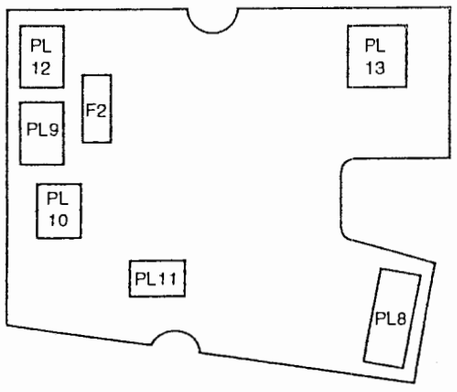
PL12 – 3 WAY MICROPHONE

PIN	COLOUR	SIGNAL
1	N/C	N/C
2	GREY	+9V
3	GREY	GND

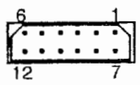
PL13 – 4 WAY TO INTEROCULAR MEMBRANE SWITCH

PIN	SIGNAL
1	SWITCH 1
2	SWITCH 1 RTN
3	SWITCH 2
4	SWITCH 2 RTN

H.R. BOARD 230-053-01



HARWIN DATAMATE HEADER END VIEW



SYMPTOM	POSSIBLE CAUSE	TEST	TEST FAILS	PAGE No.
Visette® has no picture in either eye, but has sound	1. Ensure power is correctly applied to the Format D.	a. Check Credit Column is lit up. b. Check 8-way power plug is fully pushed into Format D and PSU.	Faulty credit module PSU or Mains. Seat correctly	3.8 (Table 2,1.1) 3.7 No. 13
	2. Check brightness pots.	Adjust pots.		3.3
	3. Check A/V cable.	a. Check external player's view monitor b. Visually inspect A/V cable co-ax plugs. c. Check cables for shorts and continuity.	Replace A/V cable.	3.8 (Table 1)
	4. Check SIC connector.	a. Visually inspect connector for damage. b. Check all gold contacts are in place. Visually inspect for bent pins.	Replace Visette®. Straighten Format D pins.	3.8 (Table 2)
	5. Credit Module PSU faulty.	Check +12v, +5v and GND from PSU.	Replace PSU and power loom.	3.12 (Table 13)
	6. Check Visette® voltage	Test pin 11 of SIC Connector for 9v.	Replace Format D assy.	3.8 (Table 2)
	7. Run ETS (test visette®)	a. Flex loom near visette® and check left eye for operation. b. Flex front of visette® and check left eye for operation.	If OK, replace Visette®. If OK, replace Visette®.	ETS Page 11 ETS Page 11
	8. Faulty Visette®	Replace with a known working visette®.	Replace Format C	2.1
No right eye - intermittent	1. Brightness pot low	Turn pot.		3.3
	2. Visette® loom SIC connector	a. Visually inspect connector for damage b. Check all gold contacts are in place.	Replace Visette® Replace Visette®	3.8 (Table 2) 3.8 (Table 2)
	3. Format D SIC plug	Visually inspect for bent pins	Straighten pins	3.8 (Table 2)
	4. Run ETS (test visette®) 5. Faulty visette	a. Flex loom near visette® and check left eye for operation. b. Flex front of visette® and check left eye for operation. Replace with a known working visette®	If OK, replace Visette® If OK, replace Visette® Replace Format C	ETS Page 11 ETS Page 11 2.1
	6. A/V cable	a. Visually inspect co-ax inserts. b. Check cable for shorts and continuity.	Replace A/V cable Replace A/V cable.	3.8 (Table 1) 3.8 (Table 1)

SYMPTOM	POSSIBLE CAUSE	TEST	TEST FAILS	PAGE No.
No left eye - intermittent	1. Brightness pot low	Turn pot.		3.3
	2. A/V cable	a. Check external players' view monitor	Replace A/V cable	3.8 (Table 1)
		b. Visually inspect A/V cable co-ax plugs.	Replace A/V cable.	3.8 (Table 1)
		c. Check cable for shorts and continuity.	Replace A/V cable.	3.8 (Table 1)
	3. Visette® loom SIC connector	a. Visually inspect connector for damage	Replace Visette®	3.8 (Table 2)
		b. Check all gold contacts are in place.	Replace Visette®	3.8 (Table 2)
	4. Format D SIC plug	Visually inspect for bent pins	Straighten pins	3.8 (Table 2)
	5. Run ETS (test Visette®)	a. Flex loom near Visette and check left eye for operation. b. Flex front of visette and check left eye for operation.	if OK, replace Visette® if OK, replace Visette®	ETS Page 11 ETS Page 11
	6. Faulty Visette®	Replace with a known working Visette®	Replace Format C	2.1
Visette® has no sound or picture and NO EXTERNAL PICTURE.	1. Ensure power is correctly applied to the Format D.	Check Credit Column is lit up.	Faulty Credit Module PSU or mains.	3.8 (Table 2,1.1)
	2. Check output from PC.	Turn system off. Put VGA Monitor and keyboard on system and check screen.	Turn PC on or check mains/fuse.	2.7, 2.11
	3. Not running experience.	Run ETS Display format hardware (in ETS)	Report to VEL with any on-screen Format D messages not found.	ETS Page 3, 14
	4. Video graphics, Format C.	Re-set graphics card, video card and Format C board.	Report to VEL for instructions.	2.0
Visette® picture black & white	1. Failing PC PSU	Remove PC lid, check voltages; +5, -5, +12, -12	Replace PC PSU; add cooling upgrade.	2.1 No. 2
Distorted audio	1. Failing PC PSU	Remove PC lid, check voltages; +5, -5, +12, -12	Replace PC PSU; add cooling upgrade.	2.1 No. 2
	2. Dirty CD	Inspect CD	Clean CD	2.7
	3. CD ROM cabling	Inspect IDC and 4-way	Replace cables	2.16/2.17
	4. Faulty Format C	Allow PC to cool and check audio in game.	Replace Format C	2.16/2.17
	5. Faulty CD ROM	Using 3.5mm jack socket on front of CD ROM. Check Audio	Replace CD ROM	2.9
No CD ROM access on boot-up, or not able to install software.	1. Failing PC PSU			2.1 No. 2
	2. Faulty CD ROM	Run ETS; play CD	Replace CD ROM	2.9
	3. Faulty Format C	Run ETS; play CD	Replace Format C	2.16/2.17

SECTION 5

SPACE JOYSTICK 2000

PAGE

5.1 Exploded View and Parts List
5.2 Connectors and Pinouts

SYSTEM 2000

Space Joystick 2000
Parts list

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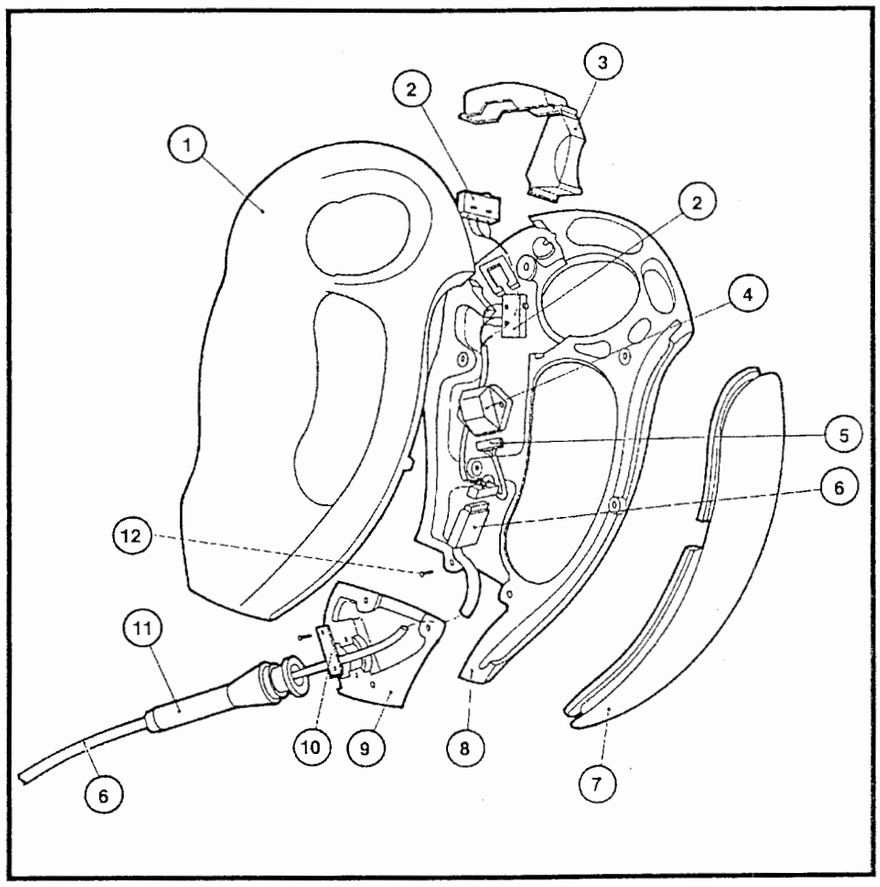

No.	DESCRIPTION	PART No.	QTY
1	HANDLE R/H	241-003-02	1
2	MICROSWITCH	209-022	2
3	BUTTON MOULDING	209-012-03	1
4	INSIDETRAK RECEIVER	239-502R	1
5	INTERNAL LOOM	241-001-03	1
6	JOYSTICK CABLE	238-119-01	1
7	BUMPER	241-005-02	1
8	HANDLE L/H	241-002-02	1
9	CONNECTOR COVER	241-004-02	1
10	ANCHOR	241-006-01	1
11	STRAIN RELIEF	241-500	1
12	SCREW No. 2 X 1/2	SWC 00064	9

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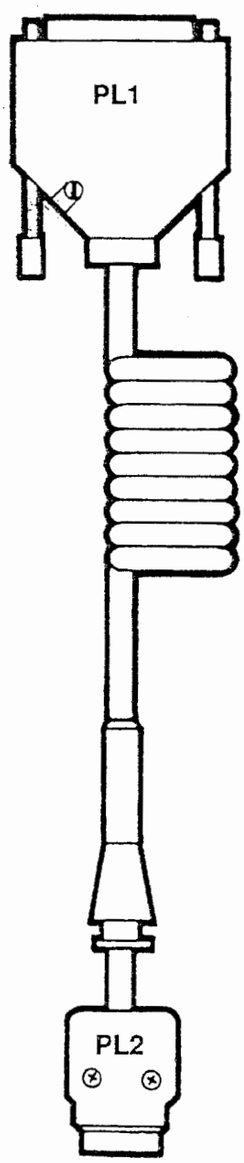

238-119-01
SPACE JOYSTICK 2000 CABLE

PL1 25-WAY D – MALE

METER READING	COLOUR	PIN No.	COMMENTS.
93Ω	BLACK	1	COIL 1 START
93Ω	WHITE	14	COIL 1 FINISH
93Ω	RED	2	COIL 2 START
93Ω	BROWN	15	COIL 2 FINISH
93Ω	BLUE	3	COIL 3 START
93Ω	YELLOW	16	COIL 3 FINISH
	SCREEN	4	COIL SCREEN
	SCREEN	17	SWITCH SCREEN
	ORANGE	5	SWITCH 1
		18	SW 1.2 RTN
	GREEN	6	SWITCH 2
		7	SW 3.4 RTN
		19	SWITCH 3
		20	SWITCH 4
		9	INPUT 6
		22	INPUT 5
		10	INPUT 4
		23	INPUT 3
		11	INPUT 2
		24	INPUT 1
		13	GLOVE SCREEN
		12	GLOVE +9V
		25	GLOVE 0V
	PINK	8	SECURITY
	GREY	21	SECURITY 0V

PL2 12-WAY HARWIN

COLOUR	PIN No.	COMMENTS.
BLACK	1	COIL 1
WHITE	7	COIL 1
RED	2	COIL 2
BROWN	8	COIL 2
BLUE	3	COIL 3
YELLOW	9	COIL 3
ORANGE	5	SWITCH 1
GREEN	11	SWITCH 2
PINK	6	SECURITY
GREY	12	GND
SCREEN	4,10	GND

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Specification

SYSTEM 2000

The InsideTRAK™ instrument uses electromagnetic fields to determine the position and orientation of a remote object. The technology is based on generating near field, low frequency, magnetic field vectors from a single assembly of three collocated, stationary antennas called a transmitter, and detecting the field vectors with a single assembly of three collocated, remote sensing antennas called a receiver. The sensed signals are input to a mathematical algorithm that computes the receiver's position and orientation relative to the transmitter.

The InsideTRAK™ instrument consists of a full size, PC (AT) compatible, System Electronics Board (SEB) that plugs into any 16 bit size spare ISA slot within the host PC, a Transmitter Frequency Module (TFM), a single transmitter and up to two (2) receivers. The SEB contains the instrument electronics, I/O address select switch (S1) and connectors to support the Transmitter Frequency Module, Transmitter and Receivers. The instrument is capable of operating at any of eight (8) discrete carrier frequencies to allow operation of up to eight instruments in close proximity to one another or to allow selection of a frequency less susceptible to interference from the operating frequencies of nearby equipment.

Position Coverage - The instrument will provide the specified accuracy when the receivers are located within a hemisphere with a radius of 30" (76.2 cm) from the transmitter. Operation with separations of up to 60" (152.4 cm) is possible with reduced accuracy.

Angular Coverage - The receivers are all-attitude

Static Accuracy - 0.5" (1.3 cm) RMS for the X, Y, or z receiver position, and 2.0° RMS for receiver orientation.

Resolution - 0.0003 inches/inch of range (0.0003 cms/cm of range), and .03°.

Latency - 12.0 milliseconds unfiltered from centre of receiver measurement period to beginning of transfer from output port.

Output - Software selectable including extended precision. Cartesian coordinates of position and Euler orientation angles are standard. Direction cosines and quaternions are selectable. English or metric units are also selectable.

Update Rate

One receiver : 60 updates/second/receiver

Two receivers : 30 updates/second/receiver

Carrier Frequency - The InsideTRAK™ may be configured with any one of eight discrete carrier frequencies to allow simultaneous operation of up to eight instruments in close proximity. Carrier frequencies are selected via colour coded Transmitter Frequency Modules (TFM). These frequencies are:

Reference	Frequency	Colour Code
1	8013 Hz (Standard)	Black
2	10016 Hz	Red
3	12019 Hz	Yellow
4	14022 Hz	Blue
5	18027 Hz	Orange
6	20032 Hz	White
7	24039 Hz	Green
8	26042 Hz	Pink

The colour dot can be found on the TFM in several locations.

Interfaces - ISA Bus. 16 bit wide FIFO for output and 8 bit wide FIFO for input.

Operating Environment - Low metallic ceilings or large metallic objects, such as desks or cabinets, located near the transmitter or receivers may adversely affect the performance of the instrument. Other devices employing frequencies near InsideTRAK's operating frequency should be kept away from the area of operation.

Operating Temperature - 10°C to 40°C at a relative humidity of 10% to 95%, non-condensing.

Physical Characteristics SEB - height 4.2" (10.7 cm) including ISA bus connections, length 13.3" (33.8 cm), maximum component height 0.625" (1.6 cm), weight 2.5 1b (1.13 Kg).

Transmitter Frequency Module - width 2.5" (6.4 cm), length 3.0" (7.6 cm), height 1.0" (2.54 cm), weight 3.7oz (105.0 gm) including attached cable. The TFM may be purchased for any of eight (8) distinct carrier frequencies.

Transmitter - Width 2.1" (5.3 cm), length 2.1" (5.3cm), height 2.3" (5.8 cm), weight 0.6 lb (0.27 Kg) excluding attached cable.

Receiver - Width 1.1" (2.79 cm), length 0.90" (2.29 cm), height 0.60" (1.52 cm), weight 0.6 oz (17.0 gm) excluding attached cable.

Power Consumption - 15 Watts continuous total from host PC's +5 VDC at 2.2 Amperes max and -5 VDC at 20 milliamperes max.

Sync Cable Module

The Sync Cable module (SCM) comprises a 9 pin, male "D" connector mounted on a PC Panel Bracket with a 9 wire, 6 inch long ribbon cable connected to a 26 pin header connector. The pinouts for the 9 pin "D" connector are as follows:

Pin	Function
6	SYNC IN POSITIVE
1	SYNC IN NEGATIVE
7	SYNC OUT POSITIVE
2	SYNC OUT NEGATIVE
3	SYSTEM GROUND

VIRTUALITY®

Transmitter Frequency Module

The Transmitter Frequency Module (TFM) is a separate unit that provides the unique carrier frequency for the InsideTRAK™ instrument. The TFM plugs directly into the P1 port on the SEB via a 9 pin male "D" connector (Figure 6.5.1) located at the end of a 1 foot attached cable. The opposite side of the TFM package has a 15 pin "D" connector that accepts the Transmitter connector.

CAUTION! DO NOT CHANGE TFM MODULES WITH POWER ON!

Receiver(s)

The Receiver is physically shown in Figure 6.5.2. The Receiver package provides 2 mounting holes for #4 screws (supplied) in the event that Receiver mounting is required. In this case, the supplied nylon hardware is required.

Transmitter

The transmitter is dimensionally shown in Figure 6.6.1 including the position of the electrical centre. There are 4, 1/4" - 20 NC tapped holes provided on the bottom surface for mounting. Nylon hardware (supplied) should be used when locating the Transmitter in a fixed position.

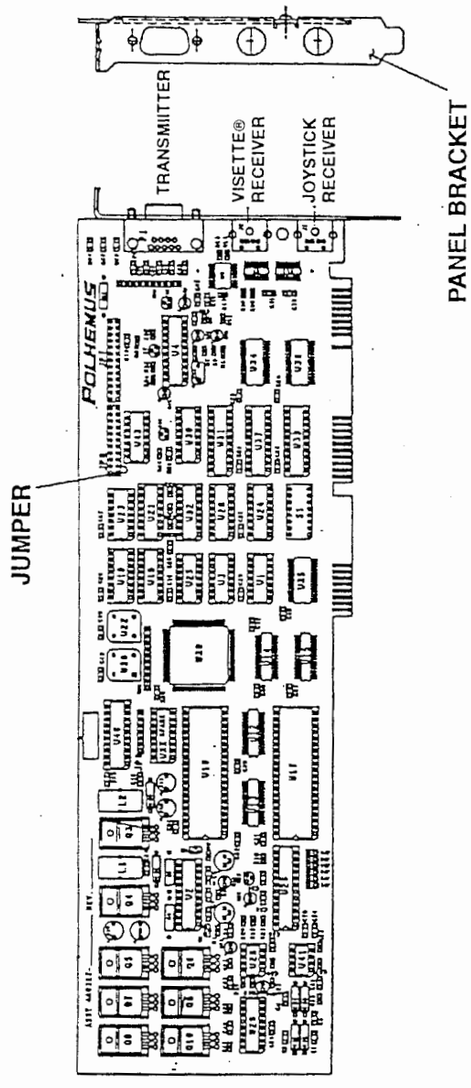
TRANSMITTER CONNECTION INTO FREQUENCY MODULE

15 PIN D-TYPE SOCKET				
METER READING	PIN No.	COLOUR	SIGNAL	COMMENTS
2.3Ω	2	BLACK	SIGNAL	COIL1
	10	WHITE	RETURN	
2.3Ω	3	RED	SIGNAL	COIL 2
	11	BROWN	RETURN	
2.3Ω	4	BLUE	SIGNAL	COIL 3
	12	YELLOW	RETURN	

VIRTUALITY®

TRANSMITTER

Fig. 6.6.1



SYSTEM ELECTRONICS BOARD
Fig. 6.7.1

AMENDMENT No. 1

SECTION 6
Tracking System

PAGE

6.1 Overview and Specification

6.2 Transmitter Frequency Module Colours

6.3 General Description

6.5 T.F.M./Receiver (sensor) Diagrams

6.6 Transmitter (source) Diagram

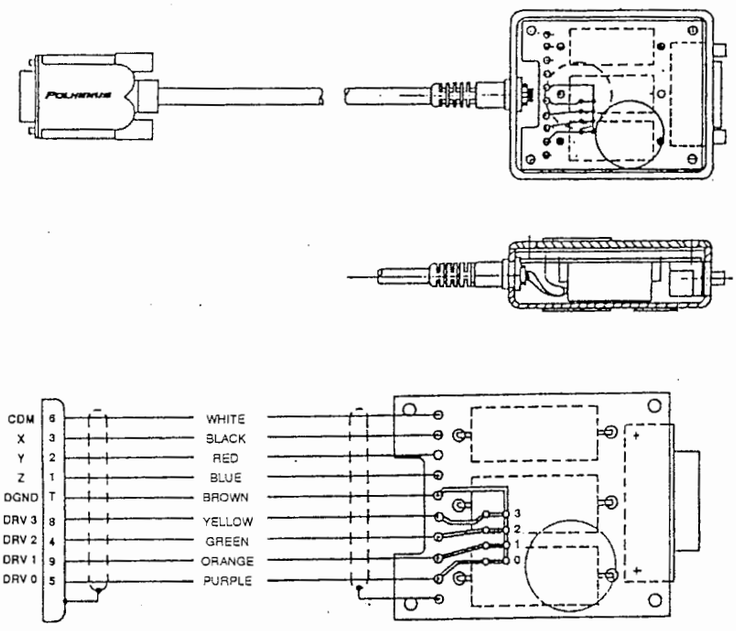
6.7 InsideTRAK P.C.B.

6.8 Fault Finding Guide

6.9 Re-calibrating offsets

AMENDMENT No. 1

SYSTEM 2000



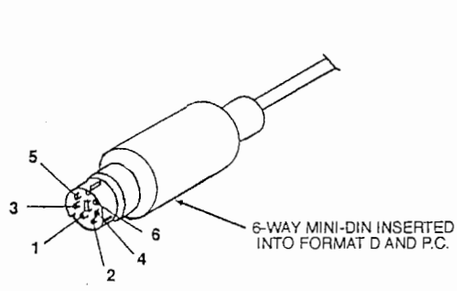
WIRING DIAGRAM

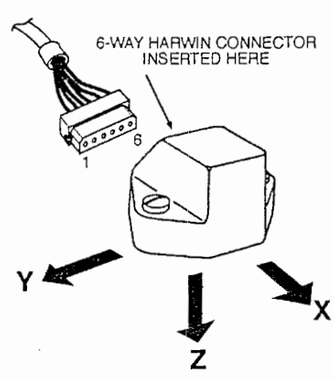
TRANSMITTER FREQUENCY MODULE

Fig. 6.5.1

6-WAY MINI-DIN FOR VISETTE® AND JOYSTICK

METER READING	PIN No.	COLOUR	COMMENTS.
93Ω	1	BLACK	COIL1
	2	WHITE	
93Ω	3	RED	COIL2
	5	BROWN	
93Ω	4	BLUE	COIL 3
	6	YELLOW	
		GREEN	CUT BACK
		SCREEN	





RECEIVER

Fig. 6.5.2

SYMPTOM	POSSIBLE CAUSE	TEST	TEST FAILS	SEE PAGE
Tracker jitter	1. Outside interference (metalwork, motors, monitors, power lines, fluorescent lights etc.)	Re-locate unit		
	2. Dislodged tracker mini-din	Visually inspect associated cables; check sensor continuity	Re-seat offending plugs	3.9
	3. Fluorescent 2D lamp (credit module)	Remove power to 2D lamp (+12v)	If OK, replace 2D lamp driver circuit	3.17 (Item 17)
	4. Source connectors	Visually inspect connectors and cables; check continuity	Re-seat plugs	6.4
	5. Tracker PCB	Replace frequency MOD	Replace Tracker PCB	6.7.1
Inverted Tracker/wrong angles	1. Outside interference (metalwork, motors, monitors, power lines, fluorescent lights etc.)	Re-locate unit		
	2. Dislodged tracker mini-din	Visually inspect associated cables; check continuity	Re-seat offending plugs	3.9
	3. Source connectors	Visually inspect connectors and cables	Re-seat plugs	6.4
	4. Incorrect offsets	Run ETS - Tracker Offsets	Follow re-calibrate offsets procedure	6.9
	5. Dislodged tracker mini-din	Visually inspect associated cables; check continuity	Re-seat offending plugs	3.9
	6. Source connectors	Visually inspect connectors and cables; check continuity	Re-seat plugs	6.4
	7. Tracker PCB	Replace frequency MOD	Replace Tracker PCB	6.7.1

AMENDMENT No. 1

SYSTEM 2000

1. Switch off the PC.

2. Connect the keyboard and the VGA monitor to the computer, then switch on.

3. When the message "About to run experience Zone, Press any key to abort", press the **Space bar** within ten seconds.

4. Type "run SP" and enter.

5. From Supervisory Program (SP), press **F3** to enter ETS program.
   Wait for ETS to load – if it doesn't load, typr "run ETS" and enter.

6. Press **F1** to enter the test tracker menu.

7. From the tracker menu, press **F8** to enter calculate sensor offsets.

8. Press **F2** to turn on the tracker world screen in the Visette®.

9. Select the sensor number to change tracker offsets using **Pg up** and **Pg dn**

   Sensor 1 is the master Visette®
   Sensor 2 is the master joystick
   Sensor 3 is the slave Visette®
   Sensor 4 is the slave joystick

10. To re-calibrate the tracker sensor:-

    a. Step into the machine and place the Visette® on your head.

    b. Face towards the joystick holster side of the machine with your head level.

    c. Press the joystick trigger button once only to re-align the sensor to the grid.

    d. you should now be looking at the +Y section of the grid. Remove the Visette® and carefully place the joystick in the holster.

11. Note down the main sensor offset figures.

AMENDMENT No. 1

SYSTEM 2000

12. Press **Escape** on the keyboard followed by **Escape** again and then **Shift+Escape** together.

13. At the C:> prompt, type "edit config.vpc"

14. Move the cursor down the file to the sensor number which has been re-calibrated and enter the new figures.

15. Press **Alt, F, X**, and then Y.

16. Repeat steps 9 to 15 for each sensor which is incorrectly aligned.

17. Switch off the PC, wait 15 seconds the restart the machine. Operate the SU 2000 to check performance is correct.

VIRTUALITY®

SECTION 7
Engineering Test Systems

PAGE

7.1 Engineering Test Systems – Manual

SU2000 CyberBase

SU 2000

ENGINEERING TEST SYSTEMS

User Manual

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VIRTUALITY®

Virtuality Entertainment Ltd.
Virtuality House
3 Oswin Road
Brailsford Industrial Park
Leicester LE3 1HR
Tel : 44 (0)533 542127 Fax: 44 (0)533 471855
Customer Service Dept.
Tel: 44 (0)533 548571
Fax: 44 (0)533 548573

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CONTENTS PAGE

Introduction....3
Running ETS....3
Special Keys....3
General principles....3
Library loading screen....4
Command line options....4
Main menu....5
Menu 2....5
Test tracker....6
Main sensor screen....6
Jitter test....6
Display hemispheres....6
Display offsets....6
Display sensor map....7
Tracker world....7
Display tracker hardware....7
Calculate sensor offset....7
Terminal emulator....7
Test format hardware....8
Console lights / buttons....8
Joysticks....8
Sound volumes / switching....8
Coinop....9
Test buttons....9
Display format hardware....9
Test registers....9
Test CD....10
Test network....11
Display networked machines....11
Echo test....11
Display network hardware....11
Test visette....11
Test sound....12
Display library data....13
Display hardware data....14
Display all hardware....14
Display tracker hardware....14

Display format hardware 14
Display graphics hardware 14
Display network hardware 14
Display sound hardware 14
View configuration file 15
View configuration file errors 15
Troubleshooting Guide 16
General points 16
Format card 16
Visette® 16
CD 16
Index 17

Introduction

The Engineering Test System (ETS) allows a ModuloPC to be fully tested. Facilities exist to allow each piece of hardware to be tested in isolation, and also in conjunction with other pieces of hardware.

Running ETS

To run ETS from DOS, type '**run ets**'. To run ETS from the Supervisory Program select the **ETS** option from the main menu.

Special Keys

There are a number of special keys on the keyboard which are used in ETS:

ESC The escape key is located at the top left of the keyboard and is labelled '**Esc**'. It is used to escape from the current operation or menu and return to the previous menu.

RETURN The return or enter key is the large key at the right of the main group of keys on the keyboard - do not confuse it with the **BACKSPACE** key which is immediately above it or the **SHIFT** key which is immediately below it.

← ↑ ↓ → The four keys marked with arrows to the right of the main group of keys are known as the cursor keys. They are often used to select a value to be changed e.g. when testing console lights and buttons the current light is selected using the cursor keys.

PgUp **PgDn** These keys are found in the block of six keys which is immediately above the cursor keys.

SPACE The space bar is the long bar at the bottom of the keyboard. It is used to toggle the visette backlights on or off. If the visette backlights are on the ETS display can be seen in the visette.

F1 - F12 Along the top of the keyboard are the function keys labelled **F1** to **F12**.

The ESC key is the universal 'quit' key, it will get you out of almost everything in ETS. The one exception to this is the main menu. Exiting from the main menu will exit the ETS program and is achieved by holding down the SHIFT key and pressing ESC.

General Principles

If possible, ETS should be run with a monitor connected to the graphics output and a monitor connected to the Modulo PC's VGA output. ETS output appears on the VGA screen and also on any monitors connected to the output of the graphics cards. Since

the graphics cards are connected to the visette, the ETS output will appear in the visette if the visette backlights are turned on. SPACE can be used to toggle the visette backlights on and off.

The VGA output and the graphics output will usually be the same, however some ETS tests are specifically designed to test the graphics output (e.g. Test Visette, Tracker World) in which case the VGA output and graphics output will be different. If you only have monitors connected to the graphics output of your Modulo PC, you will not see the normal ETS text when one of these tests is run. Remember that you can always use ESC to quit from the current test.

Library loading screen

When ETS is run, the first screen that appears is the library loading screen. Details of each library are displayed as it is opened. Once ETS is running, this screen can be recalled using the 'Display library data' option from menu 2 (page 5).

Command line options

It is possible to run ETS without having to load up all of the libraries. Use the '/-' option to remove a library from the list of libraries to be opened and use '/+' to add a library to the list of libraries to be opened. Library codes are as follows:

v	VPC library
p	PIX library
t	TRK library
f	CTRL library
n	NET library
c	CD library
s	SND library
*	All libraries

/- and /+ options are interpreted from left to right. E.g. to open all libraries except the tracker library type:

run ets /-t

To open just the VPC and CTRL libraries type:

run ets /-* /+vc

Main menu

The main menu is the first screen to be displayed after the libraries have been opened. It provides access to all of the main hardware test functions, and also access to menu 2. The following options are presented:

F1 Test tracker

F2 Test format hardware

F3 Test CD

F4 Test network

F5 Test visette

F6 Test sound

F7 Menu 2

To exit from the main menu (and therefore from ETS), hold down the SHIFT key and press ESC.

Menu 2

Menu 2 provides access to more test functions. Press ESC to return to the main menu.

F1 Display library data

F2 Display hardware data

F3 View configuration file

F4 View configuration file errors

TEST TRACKER

Main sensor screen

This screen displays the X, Y, Z positions and the azimuth, elevation and roll angles of each active sensor. Also shown are the distance of each sensor from the origin and an axis set (or targ) giving an indication of the orientation of the sensor.

F1 Toggle the display of the homogeneous transformation matrix for each sensor.

PgUp / PgDn If more than four sensors are active, these keys can be used to select the sensors that are displayed.

Jitter test

The jitter test is used to determine the amount of interference a particular sensor is experiencing. The sensor should be fixed in position, then the test started. As the test is being run, the maximum and minimum values of the 6 sensor parameters (X, Y, Z positions, azimuth, elevation and roll angles) are monitored and the range of values found is displayed. The greater the range, the more interference the sensor is experiencing.

F1 Start a 10 second jitter test.

F2 Start a 20 second jitter test.

F3 Start a 30 second jitter test.

F4 Start a 60 second jitter test.

RETURN Start an indefinitely long jitter test. Whilst any jitter test is in progress, **RETURN** can be used to stop the test.

PgUp / PgDn If more than four sensors are active, these keys can be used to select the sensors that are displayed.

Display hemispheres

Display the current hemisphere for each sensor. Active sensors are shown highlighted.

Display offsets

Display the current world offset and sensor offset for each sensor. Active sensors are shown highlighted.

PgUp / PgDn Select the sensors to be displayed.

Display sensor map

Display the sensor map showing which physical sensors (hardware sensors) are mapped to which software sensor numbers. Active sensors are shown highlighted.

Tracker world

Tracker world is a small grid lined world which tests out the head and hand tracking. The hand is represented by a small axis set (targ). It can be used to confirm that the tracker hardware is operating correctly. A display of the head and hand positions for each player is also given.

Display tracker hardware

A Modulo PC can have up to 32 tracker cards connected to it. This option allows hardware details of each card to be displayed. Note that cards that are not open are also displayed. This option is also found in the 'Display hardware data' menu.

PgUp / PgDn Select the card to be displayed.

Calculate sensor offset

This option is not for general use. If necessary, instructions for its use can be obtained from Virtuality Entertainment Ltd.

Terminal emulator

This option is not for general use. If necessary, instructions for its use can be obtained from Virtuality Entertainment Ltd.

TEST FORMAT HARDWARE

Console lights / buttons

There are four buttons, each with a light mounted on the console. The state of each button is displayed, and the state of the lights can be changed using the following keys:

←↑↓→	Select the current light.
F1	Set the current light off.
F2	Set the current light on.
F3	Set the current light to flashing.

Joysticks

The joystick test screen displays test data for SD and SU space joysticks. SDs are fitted with 1 joystick and 1 Tee shift. The SD joystick returns both X, Y position data and data from the two buttons. The T shift simulates a joystick moving in the Y direction only. It has two positions - forward and back. The Y values returned for these positions correspond to those returned by a joystick in the fully forward or fully back positions respectively. The X value for the T shift should be ignored. An SU is fitted with one space joystick which returns its position via the tracker test functions and is fitted with two buttons. Note that the SU joystick buttons are wired to the right SD joystick buttons.

Sound volumes / switching

PgUP/PgDn	Select the player to be displayed.
←↑↓→	Select the current signal to change.
PgUp / PgDn	Select the player to view the sound settings for.
F1	Set full volume for the current signal (255).
F2	Set half volume for the current signal (128).
F3	Set zero volume for the current signal.
F4	Toggle between one channel and both channels. By default, both left and right channels will be affected by volume and switch changes. This key allows the user to toggle into a single channel mode where only one channel will be affected.
F5	Start a CD track playing - the longest audio track on the CD will be repeated.

F6	Stop the CD from playing.
F7	Start a sound sample playing.
F8	Stop a sound sample playing.
F9	Toggle the signal to the visette. If the signal is currently switched to the visette, it will be switched off. If the signal is not currently switched to the visette, it will be switched to the visette.
F10	Toggle the signal to the external speakers. If the signal is currently switched to the external speakers, it will be switched off. If the signal is not currently switched to the external speakers, it will be switched to the external speakers.
+ / -	Change the volume of a signal.

Coinop

The coinop test screen allows the credit system connected to each console to be tested.

↑↓	Select the current player.
RETURN	Remove a credit from the current player.

Test buttons

It is possible to connect other buttons to the system in addition to the console and joystick buttons. This option allows these extra buttons to be tested.

PgUp / PgDn	Select the player whose buttons are to be displayed.

Display format hardware

A Modulo PC can have up to 32 format cards connected to it. This option allows hardware details of each card to be displayed. Note that cards that are not open are also displayed. This option is also found in the 'Display hardware data' menu.

PgUp / PgDn	Select the card to be displayed.

Test registers

This option is not for general use. If necessary, instructions for its use can be obtained from Virtuality Entertainment Ltd.

TEST CD

The CD test screen displays details of the CD in the current drive and allows tracks from the CD to be played.

To aid testing, all audio signals except the CD signal are muted and the CD signal is switched to the external speakers. To test the mixing of sounds from several sources see the section on sound volumes and switching (page 8).

PgUp / PgDn	Select the current drive.
↑ ↓	Select the current track.
F1	Set the CD output to full volume.
F2	Set the CD output to half volume.
F3	Set the CD output to zero volume.
+	Increase the volume of the CD.
-	Decrease the volume of the CD.
RETURN	Play the current track.
F4	Stop playing the current track.
F5	Pause / resume the current track.

TEST NETWORK

Display networked machines

A list of all machines connected to the network and running ETS is displayed.

Echo test

This test allows two way communication with all machines on the network to be tested. When a character is typed on the keyboard it is sent to all machines currently running ETS. These machines will then echo the character back to the testing machine where it will be displayed on the screen. Any lost or incorrect characters can be easily spotted. To clear the display, press **RETURN.**

Display network hardware

Details of the network card attached to the MODULO PC will be displayed.

TEST VISETTE

This option will display a test bitmap in all visettes attached to the system, and allows the visette backlight brightness to be changed.

↑ ↓	Select the current player.
F1	Set full brightness for the current player (255).
F2	Set half brightness for the current player (128).
F3	Set zero brightness for the current player.
+	Increase the visette brightness for the current player.
-	Decrease the visette brightness for the current player.

To decrease the possibility of the visette backlights burning out, they will only operate if a correct video signal is being supplied to the visette. If there is no video signal present, the visette brightness will also be zero and cannot be changed.

TEST SOUND

Each player on a system has a set of sound hardware which allows sound samples for that player to be loaded and played. The sound hardware is located on the format C card, but is addressed separately to the format hardware.

To aid testing, all audio signals except the sound effects (FX) signal are muted, and the sound FX signal is switched to the external speakers. To test the mixing of sounds from several sources see the section on sound volumes and switching (page 8)

↑ ↓	Select the current sample.
PgUp / PgDn	Select the current sound card.
F1	Set the sound FX output to full volume.
F2	Set the sound FX output to half volume.
F3	Set the sound FX output to zero volume.
+	Increase the volume of the sound FX.
-	Decrease the volume of the sound FX.
F4	Load a sample to the sound card. A list of available samples is presented, use ↑ and ↓ to highlight the desired sample, then **RETURN** to load it. You are then given the option of making the sample repeat when it is played. Press **Y** (for yes) to make the sample repeat forever when it is played, press **N** (for no) to make the sample play through once and then stop. Note that this option only loads the sample onto the sound card, **F5** must be used to actually play the sample.
F5	Play the current sample. When prompted, enter a channel number in the range 1 - 16 and press **RETURN**.

DISPLAY LIBRARY DATA

This screen provides information about the libraries used by ETS to interface to the hardware. It is essentially the same as the screen that was displayed while ETS was loading (page 4). Each library is listed along with its version number and any errors that occured while the library was being opened. Most of the libraries are used to interface to particular pieces of hardware as shown below:

VPC This does not correspond with any particluar piece of hardware. It contains utility functions that are used by the other libraries.

PIX Graphics hardware.

TRK Tracker hardware.

CTRL Format hardware.

NET Network hardware.

CD CD hardware.

SND Sound hardware.

By default, ETS tries to open all of the libraries when it is run, however it is possible to disable some of the libraries. This will also prohibit any testing of the associated hardware. See page 4.

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DISPLAY HARDWARE DATA

The tests available in this menu will list details about the hardware connected to the Modulo PC. A number of the options are also available from other ETS menus. E.g. the 'Display tracker hardware' option can also be found in the tracker test menu.

Display all hardware

A summary of all of the hardware in the system is displayed. Each card listed in config.vpc is displayed with details of its IO address and memory address.

Display tracker hardware

A Modulo PC can have up to 32 tracker cards connected to it. This option allows hardware details of each card to be displayed. Note that cards that are not open are also displayed. This option is also found in the 'Tracker test' menu.

PgUp / PgDn Select the tracker card to be displayed.

Display format hardware

A Modulo PC can have up to 32 format cards connected to it. This option allows hardware details of each card to be displayed. Note that cards that are not open are also displayed.
This option is also found in the 'Test format hardware' menu.

PgUp / PgDn Select the card to be displayed.

Display graphics hardware

The graphics hardware is divided into channels. Each channel has one video card associated with it, and can have several processor cards associated with it.

PgUp / PgDn Select the channel to be displayed.

↑↓ Select the processor card to be displayed.

Display network hardware

Details of the network card attached to the Modulo PC will be displayed.

Display sound hardware

PgUp / PgDn Select the card to be displayed.

VIEW CONFIGURATION FILE

This option allows you to view the configuration file but not change it. It is useful for checking the contents of the configuration file if a library does not appear to be opening the correct hardware.

← ↑ ↓ →	Move around the file one line at a time.
PgUp / PgDn	Move around the file a page at a time.

VIEW CONFIGURATION FILE ERRORS

Any errors found in the configuration file are logged when the libraries are first opened. This option allows you to view that error log.

↑ ↓	Scroll through the errors.

TROUBLESHOOTING GUIDE

WARNING

THE MODULO PC **MUST** BE SWITCHED OFF BEFORE ANY HARDWARE ADJUSTMENTS ARE MADE AND ANTI-STATIC PRECAUTIONS TAKEN.

General points

Check that:

- all cards are firmly plugged in (unplug and reconnect them to be sure).
- all connections are secure (disconnect and reconnect them to be sure).
- all jumpers on the cards are set correctly.

If the problem only occurs with an experience and disappears when ETS is run, try re-installing the experience.

If the problem is on a two player system, does the problem occur for both players ? If not, try swapping hardware from the good player with hardware from the bad player to isolate the fault. **NOTE:** If you swap over PCBs in the Modulo PC, remember to change jumper settings as necessary.

Format card

In order for the software to recognise that a format C card is present, it must be plugged in to its associated format D card and the format D must be switched on.

Visette® 2

If the visette® backlights are not working, check that the video signal is connected. The backlights will not operate unless the LCDs are receiving a correct video signal.

CD

If a CD error message is displayed as the Modulo PC is starting up, check that the ribbon cable connecting the format card to the CD drive is connected the right way round at the format card end.

B
backlights, 11, 16
C
Calculate sensor offset, 7
CD, 10
Coinop, 19
Command line options, 4
configuration file
    errors, 15
    viewing, 15
connections, 16
Console lights / buttons, 8
Contents, 1
cursor keys, 3

D
Display all hardware, 14
Display format hardware, 14
Display graphics hardware, 14
Display hardware data, 14
Display hemispheres, 6
Display library data, 13
Display network hardware, 11, 14
Display networked machines, 11
Display offsets, 6
Display sensor map, 6
Display sound hardware, 14
Display tracker hardware, 7, 14

E
Echo test, 11
ESC, 3

F
Format, 8
format card, 16
troubleshooting, 16
format hardware, 9
function keys, 3

G
General points, 16
General Principles, 3

H
hardware sensor, 6

I
Index, 17
Introduction, 3

J
Jitter test, 6
Joysticks, 8
jumpers, 16

L
LCD, 16
Library loading screen, 4

M
main menu, 5

N
network, 11

P
PgDn, 3, 15
PgUp, 3

R
RETURN, 3
Running ETS, 3

S
sensor offset, 7
software sensor, 6
Sound volumes / switching, 8
SP, 3

SPACE, 3
Special Keys, 3
Supervisory Program, 3

T
Terminal emulator, 7
Test buttons, 9
Test registers, 9
Test sound, 12
Tracker, 6
Tracker world, 7
troubleshooting, 16
    format card, 16
    general points, 16
    Visette®, 16
troubleshooting Guide, 16

V
VGA, 3
video signal, 16
visette, 11, 16
    troubleshooting, 16

SECTION 8

Help Details And Warranty Returns

PAGE

8.1 Help Details

8.2 Warranty Returns Procedure

8.4 Warranty Request Part Order Form

8.5 Warranty Return Sheet

AMENDMENT No. 1

SYSTEM 2000

HELP DETAILS

We hope this manual has been of great assistance in solving any problem you may have with your SU 2000 Virtuality® unit. If however you still have any queries, please do not hesitate to call your local Virtuality distributor or contact:

VIRTUALITY ENTERTAINMENT LTD. U.K.
CUSTOMER SERVICE DEPARTMENT

TEL: 44 (0) 116 2548571
FAX: 44 (0) 116 2548573

VIRTUALITY ENTERTAINMENT INC. U.S.A.

TEL: 1 (0) 214 556 1800
FAX: 1 (0) 214 556 1890

VIRUALITY K. K. JAPAN

TEL: 81(0) 3 3552 0188
FAX: 81(0) 3 3552 0073

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WARRANTY RETURNS PROCEDURES

This procedure describes the actions, routes and departments involved in processing items returned by customers under the Virtuality Entertainment Ltd Warranty.

1. Customers contact the Customer Service Department to request replacement items due to faults. (See Appendix 1)

2. The order is allocated with the next number from the Part Replacement File (ie: PO.....) and a Part Replacement Form is filled in.

NB: When the parts have been sent out, the form is updated and filed in the Part Replacement File.

3. Customer Service then initiates a request to Stores for the part/s required using a Material Requisition Form.

4. Stores supply the part/s which are then allocated with the next warranty return number in the Warranty Log Book and the relevant details filled in. Parts are then packed by Stores with:-

   a) A Packing Note
   b) A Warranty Return sheet. (see appendix 2)

5. A rough Commercial Invoice is then drawn up and taken with the package to shipping who use this information to type out a proper invoice and fill in the advice note.

6. Customer is then given 30 days to return the items.

7. If the part/s have not been returned by day 30 a reminder letter is faxed warning that the customer will be charged if the item/s are not returned within the following 7 days.

NB: Care must be taken to quote the serial number of parts on all forms and correspondence to help referencing.

8. Returned parts arrive in Stores who then inform Customer Service Department. These parts are then logged into the Warranty Log Book. A Warranty Return Progress Form is then filled in.

9. Parts are then assessed by designated personnel in order to decide the relevant disposal route the items should follow. These are:-

a) Return to manufacturer for further assessment and repair.
b) Repair in-house by relevant in-house department and return to Customer Service Stores.

c) Return to Customer Service stores for parts of item to be used.
d) Scrap

10. Wherever possible a decision is also made at this stage as to whether the customer is to be credited or charged for the parts.

NB: i) Virtuality Entertainment Ltd policy is that an item is only covered under Warranty if the fault is found to be that of manufacturing or design and not misuse by the customer.

ii) The decision cannot always be made on items which need to be returned to the manufacturer for assessment until the manufacturers report is submitted.

REQUEST FOR WARRANTY PARTS FROM CUSTOMER SERVICE DEPARTMENT

Company:	Invoice:	Delivery:
Contact Name:	Address:	Address:
Date:		

Item No.	Part Name	Part No.	Machine Serial No.	Quantity	Symptom
Example					
1	*Headband Pad*	*230-050-02*	*SU2009/A*	*1*	*Pad split*

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SYSTEM 2000

WARRANTY RETURN #WR00

The following items are logged under the warranty return number above. The faulty items should be shipped to Virtuality® within 28 days. When returning, please include this form. Thank you for your co-operation.

PART NO.	DESCRIPTION	QUANTITY
1)		
2)		
3)		
4)		
5)		

Date as per shipping documentation.

```
                                        CONFIG.VPC
; VPC Hardware configuration file - SU 2 player version
; Last updated 4-2-94

[TRK]
        CONSOLE_TYPE    SU

        SENSOR1
                SENSOR_OFFSET   -29 95 -236 -16 -55 68

        SENSOR2
                SENSOR_OFFSET    73 18 -4 90 -2 -94

;        SENSOR3
;                SENSOR_OFFSET   -29 95 -236 -16 -55 68
;
;        SENSOR4
;                SENSOR_OFFSET    73 18 -4 90 -2 -94
;
        TRACKER1
                INSIDETRAK
                IO_ADDRESS      0x270
                SENSOR_MAP      12..

;        TRACKER2
;                INSIDETRAK
;                IO_ADDRESS      0x278
;                SENSOR_MAP      ..12
//                SYNC_MODE     EXTERNAL


[CTRL]

        FORMAT1
                FORMAT_CARD
                MEM_ADDRESS     0xe0000
                IO_ADDRESS      0x210
                VISETTE_mono

;        FORMAT2
;                FORMAT_CARD
;                MEM_ADDRESS     0xe0800
;                IO_ADDRESS      0x218
;                VISETTE_MONO

[CD]
;FOR IDE DRIVES, CHANGE MITSUMI TO MSCDEX
        cd1
                MITSUMI
                io_address      0x338

;        cd2
;                MITSUMI
;                io_address      0x358


[SND]

        DMA     1,3

        sound1

                Port            0x330
```

```
                IRQ             12
                Code            SNDSCAPE.COD
                Mode            MIDI

                SBEnable        TRUE.

                ; Synthesizer Configuration

                Channels        On,On,On,On,On,On,On,On,On,On,On,On,On,On,On,On
                Priority        2,3,4,5,6,7,8,9,10,1,11,12,13,14,15,16

                MasterVol       255
                SynthVol        127

;       sound2
;
;                Port            0x350
;                IRQ             15
;                Code            SNDSCAPE.COD
;                Mode            MIDI
;
;                SBEnable        TRUE
;
;                ; Synthesizer Configuration
;
;                Channels        On,On,On,On,On,On,On,On,On,On,On,On,On,On,On,On
;                Priority        2,3,4,5,6,7,8,9,10,1,11,12,13,14,15,16
;
;                MasterVol       255
;                SynthVol        127
;
;


[PIX]

        ;Broadcast FIFO address

        broadcastFIFO   0x320

        ;Memory Address for Processor Cards

        procMem 0xD0000

        ;Video Card Addresses

        video1  0x340,WIDEPAL_DUAL_32

        ;Define Video Channels

        channel1

                MIDRES

                video1  BUSA
                proc    0x300

;       channel2
;
;                MIDRES
;
;                video1  BUSB
```

```
;               proc    0x360


[NET]
        IRQ             5
        IO_ADDRESS      0x280
        MEM_ADDRESS     0xC8000
```